Northern New York's Forests Timber Supply, Workforce, Infrastructure & Markets



November 2016



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EXECUTIVE SUMMARY

In 2015, amidst increased demand for forest products and limited supply infrastructure in northern New York, the Adirondack North Country Association (ANCA) along with partners, including the Empire State Forest Products Association (ESFPA) and the Workforce Development Institute, agreed to undertake a study of the forest products industry in this region. The study is focused on assessing the challenges for maintaining a viable northern forest timber economy and to identify options for addressing the challenges this industry is experiencing. The analysis also explores how the addition of robust complimentary markets for low and high value wood, along with additional infrastructure to support the sustainable use of this natural resource could help rebuild the northern New York 14-County economy and the subsequent economic and environmental benefits that could result. ANCA hired Innovative Natural Resource Solutions, LLC, a northeast U.S. based consulting firm with over 20 years of experience in this field, to undertake the study.

O H T A R L Q O H T

14-COUNTY NORTHERN NEW YORK STUDY AREA

THE RESEARCH FOCUSED ON FOUR CRITICAL QUESTIONS:

1) What is the potential sustainable supply of wood from private and public lands in the region, while protecting other current ecological services provided by these forests? What is the anticipated additional annual volume of timber products available to new industry, and what are the anticipated species and types of timber products that the forest might be able to yield?

2) Will forest land owners make forest resources available? Where are they located, as specifically as possible?

3) Can we expect an adequate number of loggers to supply the existing industry? If so, can we expect an adequate number of loggers with appropriate equipment to supply an expanded market for wood products? What are barriers to entry and operation in the logging business?

4) Are there transportation barriers to an expanded forest products market, and if so, what are they? How adequate are the public and private roads for transportation of forest products? What inadequacies would need rectification in order to realize the potential sustainable wood supply?



The research and data development that form the basis of this study come largely from the USDA Forest Service's Forest Inventory and Analysis (FIA) data set, the Forest Service National Woodland Owner Survey (NWOS), state data and a series of interviews with experts and forest industry business leaders. Together, these investigations and analyses result in a series of major findings:

• Of over 8.8 million acres of forestland in the region, there are approximately **3.6 million acres of accessible timberland in the region** – land not already restricted from timber harvesting. Of this available acreage, 91% is privately owned;



Timberland ownership by County (Accessible timberland, after removing acres for physical, legal and landowner decision-making reasons, is 3.6 million acres for the whole region.)



• This **timberland base** has grown significantly over the last 100 years and in recent years **is relatively stable**. The most significant change recently has resulted from the nearly 104,000 acres that have been added to the Adirondack Forest Preserve since 1993 (state ownership) and, as such, have been permanently removed from the timber base;



New York Forest Acreage

• Taking into account timberland that is not available for timber harvest for various physical, regulatory and landowner decision making reasons, there are approximately **78 million cubic feet (2.4 million tons) of timber growth each year that are not currently being harvested and are physically available for harvest without reducing the standing forest volume**. Current harvests are approximately 4 million tons annually;





• Model runs using the **Northern Forest Biomass Project Evaluator** show that, due to current timber harvest levels that are significantly below annual growth in the 14-county region, **by 2036 as much as 3.2 million additional tons of timber will be available to the timber economy than is available today.**

BPE Scenario Runs Available Timber after Existing Harvesting (green tons)



• The region contains or is adjacent to the full suite of forest products markets such that any tree harvested in the region has either a low-value or higher-value market and, compared to many other areas in the U.S., has abundant markets for forest products;

• The supply chain infrastructure to move timber to market that includes harvesting and trucking is in place in the region with dozens of individual companies and hundreds of individuals working in those sectors;

• The harvesting and trucking infrastructure is <u>adequate</u> to supply the existing forest products markets at their <u>current demand level</u>;

• The harvesting and trucking infrastructure is <u>inadequate</u> to supply the existing forest products markets at <u>increased demand levels</u> such as those experienced as recently as the winter of 2014-15. This logging and trucking workforce is also aging, which suggests future constraints can be expected.





As a result of these findings, and taking into account the overall project goal of seeking to expand the forest products industry in the 14-County region, the following are recommendations that forest stakeholders in New York should work towards:

RECOMMENDATIONS

1. SUSTAIN AND GROW THE FOREST PRODUCTS MARKETS THAT EXIST TODAY

A classic tenet of economic development is to make sure you keep the economic activities that currently exist because they are providing the economic benefits of jobs, taxes and local cycling of money, and it is difficult to get them back once lost. In the case of the forest products industry in this region, which is significant and relatively robust, maintaining this economic activity and infrastructure should be paramount in forestry stakeholders' and State efforts. This is especially true because some of the existing forest products markets are facing challenges at this time.

Today, there are two electricity plants using forest-derived wood chips as fuel in the region and a third just outside the region in Vermont. There are significant stressors affecting all of these plants, along with others in the northeast region. Prices being paid for wholesale electricity have dropped significantly in recent years. This phenomenon has been caused by many issues, especially alternative fossil fuel electricity generation that competes with the wood-fueled plants. As a result, these wood markets, which represent nearly one million tons of wood fuel market annually, are at risk of closure.

The region also contains four wood pellet manufacturing plants that use approximately

500,000 tons of low-value wood raw material per year as feedstock for plant production. These plants have also been stressed in the last year and one-half as a result of low heating fossil fuel prices as well as an extremely mild winter in 2015-16. While capable of rebounding if significant cold weather returns in the coming winter, along with rising fossil fuel prices, these plants are facing economic challenges at this time. Firewood markets, which represent over one million cords per year for all of New York, according to the New York Division of Lands and Forests, have also been affected significantly by these phenomenon.

Two pulp and paper mills that use wood as feedstock for the pulp and paper-making process are also located in the study area. Since 1999 in the northeast, particularly in New York, New Hampshire and Maine, 11 of 17 pulp and paper mills have closed operation due to the reduction in the worldwide market for pulp and paper, as well as the competitiveness and product mix of particular facilities. Two of these closures were in New York. The two remaining pulp and paper mills in New York are fortunate in that their product mix is better positioned than most of the plants that have recently shut them down. Despite this, these plants are subject to the reduction of worldwide demand phenomenon, and continued operations should not be taken for granted.

The region also contains over 30 sawmills that utilize the higher value logs that come from the harvest of timber in the area. Since the recession that began in 2008-09, this sector has recovered and continues to be strong, given strong demand of their lumber products. This sector is extremely important to the forest landowner component

IN THE CASE OF THE FOREST PRODUCTS INDUSTRY IN THIS REGION, WHICH IS SIGNIFICANT AND RELATIVELY ROBUST, MAINTAINING THIS ECONOMIC ACTIVITY AND INFRASTRUCTURE SHOULD BE PARAMOUNT IN FORESTRY STAKEHOLDERS' AND STATE EFFORTS.

of the supply chain in the region, since these markets pay the forest landowner significantly more than firewood, wood pellets, pulp and paper when the timber is sold.

Lastly, the timberland base itself is extremely important to the future health of the forest products industry. The accessible timberland is 91% privately owned and is relatively stable and large. The markets timberland owners depend on are currently robust and relatively stable. The State of New York should focus on actions that help retain the private timberland base and its accessibility to support these markets.

Collectively, the stresses on the existing forest products markets in the region demand action to ensure their continued (or re-started) operation. New York forest stakeholders should make this a primary focus of future efforts.

2. ENCOURAGE FOREST PRODUCTS MARKETS TO POSITIVELY INFLUENCE THE LOGGING AND TRUCKING INFRASTRUCTURE

Perhaps the most significant impacts, both positive and negative, that can affect the forest products supply chain logging and trucking businesses are the actions of the forest products markets themselves, i.e. the pulp and paper, biomass electricity, wood pellet, firewood and sawmill businesses. Having a market for forestderived timber is the heart of the logging and trucking businesses and jobs these sectors contain. Nearly as important as the markets themselves are the manner in which the relationships between the markets and the logging and trucking businesses are conducted. Particularly important are those periods where the demand for the manufactured products from these markets are reduced and/or the times when the logging production (supply) is more than the demand can handle. During these times of quotas - whereby the markets limit the amount of harvested products they allow producers to deliver to their facilities over a period of time - it can be very stressful to the producing loggers and truckers, who count on steady income to cover labor costs and debt service for their business equipment. Care and close communication between markets and their suppliers is essential to ensure that the producers are able to keep their businesses operating during and after these constrained market periods.

The point here is that the markets themselves, and how they interact with the businesses that supply their raw material can, depending on the approaches used, either add to the economic health of the supply businesses or detract from it.





3. SUSTAIN AND GROW APPROPRIATE STATE INVESTMENT IN THE FOREST PRODUCTS INDUSTRY

Conservation Easements:

The State of New York investment in working forest conservation easements in the 14-County area – over 700,000 acres worth since 1993 – has been important to maintaining the timberland base available for harvest. While some might suggest that these conservation easement lands produce less timber than private forestland without easements, there is no direct evidence that supports this premise. Research on this topic shows no cause and effect. The state should continue to prioritize investment in Working Forest Conservation Easements. In addition, land trust Working Forest Conservation Easements should be explored as an option when New York land trusts are working with timberland owners. These are similar to agricultural conservation easements and encourage the sustainable management and harvesting of timber.

• Capital Grants: Additionally, the New York Capital Grants program has made investments in forest products industry market businesses with positive results. When these investments have been made in this industry, however, they have generally been limited to the manufacturing facility only and not to the related timber supply infrastructure. It is recommended that comparable investment be made in the timber supply infrastructure along with the manufacturing investment.

• Private Forest Owner Carrying Costs: New York State should help address private landowner carrying costs through property tax policy and cost-share programs. In addition, landowner outreach and education programs should be supported.

4. SUSTAIN AND EXPAND NEW YORK'S INVOLVEMENT IN LOGGER TRAINING PROGRAMS

The recent state appropriation to Paul Smith's College toward a modern logger training program is a good example of a number of significant opportunities to address a logging workforce that is not large enough to handle surges in demand like that experienced in the winter of 2014-15 or any other significant increased demand. The NY Logger Training (NYLT) program and SUNY ESF logger training programs at the Ranger School, in addition to the Paul Smith's program, are critically important. These are the mechanisms that will address the likely reduction in the workforce due to aging of logging personnel in the region. Since the Paul Smith's program is in its infancy, there is a great opportunity for the industry to help the College to design and develop the program to ensure it provides training that is most relevant to the needs of the logging/ trucking businesses in the forest products industry in the region. It is recommended that selected members of the forest industry ask to partner with Paul Smith's to ensure that result.

It is recommended that all players in existing forest products markets in the region think carefully about the relationship they have with their forest products suppliers with a view to the long-term health of the suppliers and industry as a whole.



I. INTRODUCTION

The Adirondack North Country Association (ANCA) has developed a Forest Industry Supply Chain Assessment Project that seeks to provide a better understanding of the current state of the timber and forests of the Clinton, Essex, Franklin, Fulton, Hamilton, Herkimer, Jefferson, Lewis, Oneida, Oswego, St. Lawrence, Saratoga, Warren, and Washington Counties area of upstate New York and the forest products industry that depends on it. Further, ANCA wishes to understand the challenges and opportunities that are faced by the forest industry supply chain in this region.

ANCA hired Innovative Natural Resource Solutions, LLC (INRS), a northeast U.S. based natural resource consulting firm (www. inrsllc.com), to conduct the project work. This report represents the results of that effort.

II. USDA FOREST SERVICE FOREST INVENTORY & ANALYSIS DATA

Beginning with this FIA analysis and through those in the later section using the Biomass Project Evaluator model, the screens and filters begin to reduce the acreage of analysis. Figure 1 shows the comparison of these alternative analyses.



Figure 1 FIA and BPE Analyses Acreage in the 14-County Area

A. FIA ASSESSMENT WITHOUT FILTERS

As part of an analysis of current opportunities for enhanced or expanded forest products utilization in northern New York, INRS has conducted an assessment of the timber resource in 14 counties in New York. The assessment that follows is without limiting filters – such as adjustments for slope, elevation, and landowner attitudes toward timber harvesting. As such, the information here should be viewed as the upper limit of physically available wood from the region; future assessments will incorporate limiting filters.

This assessment was conducted using data from the USDA's Forest Inventory and Analysis system. The Forest Inventory and Analysis (FIA) group within the USDA Forest Service collects data annually from a subset of permanent plots on a grid density of approximately one plot for every 6,500 acres of timberland. A complete re-inventory of all plots occurs every five to seven years. Unless otherwise noted, all data reported here was collected in the years 2009 through 2014 and is the latest FIA data available.

While the FIA provides the best available data on inventory, growth, removals and acreage, these data represent an average of information collected over several years and have associated sampling error. The information is presented graphically in this assessment; actual data, including sampling error, is available.



TIMBERLAND

For this assessment, INRS used FIA data from all timberland in 14 counties of New York, listed in Table 1 and shown in Figure 2.

TABLE 1. COUNTIES OF INTEREST

Clinton	Hamilton	Oneida	Warren
Essex	Herkimer	Oswego	Washington
Franklin	Jefferson	St. Lawrence	
Fulton	Lewis	Saratoga	

FIGURE 2. COUNTIES OF INTEREST



In this 14-county area, there are an estimated 12 million acres of land. Of this, 8.8 million acres are forested. Forested land includes both commercially available timberland and land with a forest that is not legally available for timber harvesting (for example, forestland in the Forest Preserve).



The 14 counties have 6.3 million acres of timberland – land that is physically and legally capable of producing a timber crop . Figure 3 shows estimated land, forestland and timberland by county.



FIGURE 3. ACRES OF LAND, FORESTLAND AND TIMBERLAND, BY COUNTY

For the remainder of this assessment, all data is exclusive to the resource available on timberland.



Of the 6.3 million acres of timberland in the 14 counties, an estimated 91% (~5.7 million acres) is privately owned. The remainder is publicly owned, either by state and local governments or federal agencies.



FIGURE 4. TIMBERLAND OWNERSHIP, BY COUNTY (ACRES)

The following figures provide information on timberland in the region.



Ninety-four percent (94%) of all timberland in the region is on land 2,000 feet or lower in elevation.







Slope refers to the ratio of rise to run on land; a steeper slope means some harvesting equipment or techniques may not be physically or economically possible. Eighty-three percent (83%) of the timberland in the region has a slope of 20% or less, and another 14% of timberland has between 21% slope and 40% slope.



FIGURE 6. SLOPE OF TIMBERLAND (ACRES)

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Of timberland in the region, 83% is a half-mile or less from the nearest road. An additional 13% of timberland is 0.5 to 1 mile from a road, and 4% is between one and three miles from a road. An estimated 6,000 acres of timberland (0.1%) is more than three miles from a road.



FIGURE 7. DISTANCE TO ROAD OF TIMBERLAND (ACRES) - PUBLIC & PRIVATE LOGGING ROADS



FORESTLAND ACREAGE TRENDS

Trends in forest cover and timberland acreage can be very useful in a study like this. Two data sets that prove most useful are seen in Figures 8 and 9 below. Figure 8 shows overall forestland trends for New York State as a whole since 1946. This figure captures the reversion of marginal farmland to forestland that began in the late 1800s when superior farmland in the midwest was sought and northeast farms abandoned. While the data does not go back far enough to show the low point of forestland acreage, in 1946 it stood at approximately 13.5 million acres while today it is at almost 19 million acres. We cannot extrapolate exactly what happened in the 14-county study area for this period but we believe this region also saw a reversion phenomenon during this period. This was probably not so severe; this region has always been more forested than the more farmland-rich areas of the state.

FIGURE 8. NEW YORK STATE FOREST ACREAGE TRENDS – 1946-2015



Source: USDA Forest Service, Forest Inventory and Analysis & earlier acreage studies, USDA FS



Figure 9 includes timberland trend data for just the 14-county area. The FIA data source only allows for sub-state access to data of this sort back to 1993. Nevertheless, these data show that timberland acreage is roughly the same as it was in 1993. Timberland acreage is a much more useful metric since it includes only forestland that is biologically capable of growing trees for commercial crops and where timber harvesting is not restricted by law or regulation.

During this period, the amount of public land timberland increased – from roughly 473,000 acres in 1993 to about 573,000 acres currently. Private land timberland decreased a similar amount as those lands were purchased by the State.







Source: USDA Forest Service, Forest Inventory and Analysis

Additional detail about State of New York timberland purchases can be found from data provided by the Division of Real Property in the New York Department of Environmental Conservation (NY DEC) (Figure 10). In the Adirondack Park region, 209,373 acres have been purchased in fee while an additional 796,953 acres of conservation easement purchases on private forestland have been purchased since 1993. Most of these acres are forestland.



FIGURE 10. NEW YORK STATE LAND ACQUISITIONS SINCE 1993

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GROWING STOCK VOLUME

On timberland in the 14-county region, there are 10.7 billion cubic feet of growing stock. Of this, 7.5 billion cubic feet (70%) is hardwood; the remainder is softwood. Figure 11 shows standing volume of growing stock by species group.



FIGURE 11. CUBIC FEET OF GROWING STOCK ON TIMBERLAND

A number of species groups individually account for less than 0.5% of standing volume. These are other yellow pines, jack pine, other white oaks, other red oaks, tupelo and black gum, yellow poplar and black walnut. Combined, these species groups account for less than 1.5% of the standing volume of growing stock in the region. Because of the de minimus presence of these species groups in the region, they are not shown in subsequent charts.



In the 14-county region, the net growing stock volume increased by an estimated 90 million cubic feet annually between 2010 and 2014, given the following components of change:

- TOTAL GROWTH of 331 million cubic feet each year;
- MORTALITY of 117 million cubic feet each year;
- HARVEST REMOVALS of 106 million cubic feet each year; and
- **OTHER REMOVALS** (for example, land moving from timberland to forest preserve status) of 18 million cubic feet each year.

Figure 12 shows each of these components by species group.



FIGURE 12. GROWTH AND DRAIN OF GROWING STOCK BY SPECIES (CUBIC FEET)



Accounting for mortality and removals, growing stock increased annually between 2010 and 2014 for every species group except cottonwood and aspen, which showed a modest decline. The largest increases, on an absolute basis, came in soft maple, hemlock and ash.







When compared to the region's forest inventory in 1993, standing volume of growing stock on timberland increased for all species groups except beech and cottonwood/aspen.







The total volume of growing stock for all species has increased from 9.2 billion cubic feet in 1993 to 10.1 billion cubic feet in 2006 and 10.7 billion cubic feet in the most recent FIA survey, completed in 2014.



FIGURE 15. TOTAL VOLUME OF GROWING STOCK, ALL SPECIES – 1993, 2006 AND 2014, CUBIC FEET



SAWTIMBER

A portion of the growing stock is considered a "sawlog" – stems of a size and quality that could be used to produce lumber. The following figure shows the sawlog and non-sawlog portion of growing stock on timberland, by species. Across all species, 57% of the growing stock in the region is classified as sawlog quality.



FIGURE 16. SAWLOG AND NON-SAWLOG PORTION OF GROWING STOCK, BY SPECIES



However, the percentages of sawlogs may be misleading. What FIA counts as sawlogs does not fit perfectly with what the market considers a sawlog. Appendix B shows the definition of each tree grade, but it is really Grade 1 sawtimber, and some Grade 2, that the market would consider sawlogs. Of everything considered a sawlog in the FIA assessment, only 30% are Grade 1 logs and 13% are Grade 2 logs. Figure 17 below shows sawtimber volumes by grades.



FIGURE 17. NET VOLUME OF SAWTIMBER, BY TREE GRADE, BOARD FEET



In the 14-county region, the sawlog volume increased by an estimated 403 million board feet annually between 2010 and 2014, given the following components of change:

- TOTAL GROWTH of 1.2 billion board feet each year;
- MORTALITY of 312 million board feet each year;
- HARVEST REMOVALS of 425 million board feet each year; and
- **OTHER REMOVALS** (for example, land moving from timberland to forest preserve status) of 56 million board feet each year.

Figure 18 below shows each of these components by species group.



FIGURE 18. GROWTH AND DRAIN OF SAWTIMBER BY SPECIES (BOARD FEET)



Accounting for mortality and removals, sawtimber volume increased annually between 2010 and 2014 for every species group. The largest increases, on an absolute basis, came in soft maple, hard maple, hemlock and pine.



FIGURE 19. SAWTIMBER TOTAL GROWTH - (MORTALITY + HARVEST REMOVALS + OTHER REMOVALS), BOARD FEET

When compared to the region's forest inventory in 1993, standing volume of sawtimber on timberland increased for all species groups except beech.





FIGURE 21. CHANGES IN SAWTIMBER STANDING VOLUME, 1993 AND 2014, BOARD FEET





B. FIA ASSESSMENT WITH SCREENS

Based upon information and suggestions from a number of foresters, regulators, land managers and conservation organizations in the region, INRS conducted another assessment of the region's forest resource, estimating the resource only on timberland that met the following criteria:

- In private ownership (while timber harvesting can and does occur on public lands, volume from this type of ownership is driven largely by non-market forces and is often not a reliable source of material for forest industries);
- Is less than one mile away from a road (includes maintained woods roads);
- Having a slope of less than or equal to 35 percent.

Using these criteria, the acreage assessed dropped from ~6.3 million acres when all timberland was included to ~5.4 million acres using the above screens.

GROWING STOCK VOLUME – SCREENED TIMBERLAND

On timberland in the 14-county region, there are 8.1 billion cubic feet of growing stock. Of this, 5.7 billion cubic feet (71%) is hardwood, and the remainder is softwood. Figure 22 below shows standing volume of growing stock by species group.



A number of species groups individually account for less than 0.5% of standing volume. These are other yellow pines, jack pine, other white oaks, other red oaks, tupelo and black gum, yellow poplar and black walnut. Combined, these species groups account for less than 1.5% of the standing volume of growing stock in the region. Because of the de minimus presence of these species groups in the region, they are not shown.

In the 14-county region, the net growing stock volume on screened timberland increased by an estimated 78 million cubic feet annually in the years 2010 through 2014, given the following components of change. Figure 23 shows each of these components by species group.



FIGURE 23. GROWTH AND DRAIN OF GROWING STOCK ON SCREENED TIMBERLAND BY SPECIES (CUBIC FEET)



Accounting for mortality and removals, growing stock on screened timberland increased annually between 2010 and 2014 for every species group except cottonwood and aspen, which showed a modest decline. The largest increases, on an absolute basis, were in soft maple and hemlock.

FIGURE 24. GROWING STOCK ON SCREENED TIMBERLAND: TOTAL GROWTH – (MORTALITY + REMOVALS), CUBIC FEET



The 1993 FIA data was not collected in a way that allows the use of comparable screens, so a time series comparison is not presented.



SAWTIMBER – SCREENED TIMBERLAND

A portion of the growing stock is considered a "sawlog" – stems of a size and quality that could be used to produce lumber. Figure 25 shows the sawlog and non-sawlog portion of growing stock on timberland, by species. Across all species, 61% of the growing stock in the region is classified as sawlog quality.



FIGURE 25. SAWLOG AND NON-SAWLOG PORTION OF GROWING STOCK, SCREENED TIMBERLAND, CUBIC FEET



However, the percentages of sawlogs may be misleading. What FIA counts as sawlogs does not fit perfectly with what the market considers a sawlog. Appendix B shows the definition of each tree grade, but it is really Grade 1 sawtimber, and some Grade 2, that the market would consider sawlogs. Of everything considered a sawlog in the FIA assessment, only 30% are Grade 1 logs and 13% are Grade 2 logs. Figure 26 below shows sawtimber volumes by grades.



FIGURE 26. NET VOLUME OF SAWTIMBER ON SCREENED TIMBERLAND, BY TREE GRADE, BOARD FEET



In the 14-county region, the sawlog volume increased by an estimated 341 million board feet annually between 2010 and 2014. Figure 27 below shows each of these components by species group.



FIGURE 27. GROWTH AND DRAIN OF SAWTIMBER ON SCREENED TIMBERLAND BY SPECIES (BOARD FEET)



Accounting for mortality and removals, sawtimber volume increased annually between 2010 and 2014 for most species groups, with only select white oaks, yellow birch and basswood showing declines. The largest increases, on an absolute basis, came in soft maple, hard maple and hemlock.



FIGURE 28. SAWTIMBER ON SCREENED TIMBERLAND - TOTAL GROWTH – (MORTALITY + REMOVALS), BOARD FEET

III. LANDOWNER INTERVIEWS, NWOS & LITERATURE SEARCH

A. LANDOWNER INTERVIEWS:

As part of research designed to inform variable choices that needed to be made in the Northern Forest Biomass Project Evaluator model runs (see next section), landowners, managers and consultants were interviewed. These professionals assisted in understanding the physical and regulatory limitations, as well as the landowner attitudes, that reduce the portion of their land bases that can be managed for forest products.

The major findings from those interviews can be summarized as follows:

 Interviewees represented approximately one million acres of forestland;

• There are confirmed limitations of slope, elevation and percentage of land managed for timber;

• With regard to likelihood of family forest landowners managing their land for timber, large landowners and managers believe that most timberland will be harvested timber at one time or another unless the tract size is very small;

• Owners with over 10 acres of forest are more likely to harvest than those with less than 10 acres;

• With regard to municipally-owned forestland, managers suggested that public lands are harvested but should not be considered a reliable source of fiber.

Further, the variable choices made in the model used were directly influenced by interview results.

B. LITERATURE SEARCH:

A literature search of scientific journals was conducted to see if researchers have developed any useful information about landowners' attitudes towards timber harvesting. We found at least five useful studies on family forest owners' attitudes and actions in the U.S., including several for New York alone. The following are the major findings from these studies:

• Landowner attitudes and beliefs are more important to a landowner deciding to harvest than are social influences (my neighbor did it) or professional ones (foresters);

• Parcel size (i.e. more likely bigger), outreach activity participation (attended workshop), harvest price and

distance from residence were the most common significant predictors of harvesting intention;

• In New England and New York, over 50% of family forest owners have harvested timber on their land in the past;

• Harvesting on family forest ownerships in New York has increased dramatically in recent years, and it should continue (2009 study).

References for the studies used can be found in the Endnotes of this report.

C. NATIONAL WOODLAND OWNER SURVEY:

Relative to family forest owners, the report authors believe that the most reliable source of information is the National Woodland Owner Survey (NWOS) from the USDA Forest Service. While the results could not be segmented to include only the 14-County region in northern New York, the systematic sample nature of the results and the breadth of questions asked and answered in the survey are tremendously helpful.

According to the USDA Forest Service:

The USDA Forest Service's National Woodland Owner Survey is an annual survey of the individuals and organizations that own over two-thirds of the privately owned woodland in the U.S. The purpose of this survey is "to increase our understanding of private woodland owners - the critical link between forests and society." In free societies, such as our own, it is the landowners who ultimately decide how a given piece of land will be used. But landowners are a part of a larger social fabric that has written rules and unwritten norms about how land should be used. The survey creates a dialogue between landowners and the rest of society so that needs and concerns of the landowners can be heard and addressed.

The major findings from the NWOS that helped inform model variable choices are the following:

• Over 65% or forest owners harvested timber of some sort since they owned their forestland;

• Nearly 50% harvested sawlogs since they owned their forestland;

• Of those that harvested timber, at least 33% of forest owners used a professional forester to help with harvest;

• In the last five years, 64% harvested some timber for sale or personal use;

• In the next five years, 64% of forest owners say that they will harvest timber for sale or personal use.

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IV. NORTHERN FOREST BIOMASS PROJECT EVALUATOR

A FUTURE LOOK AT THE FORESTS OF THE NORTHERN NEW YORK REGION

As with the FIA analysis in the section above, an analysis was conducted for the 14-County Northern New York region using the Northern Forest Biomass Project Evaluator (BPE) model. The BPE model runs also use the FIA dataset for the 14-County region. As with the FIA analysis, the BPE model used the most recent complete FIA information for the New York Counties, with data collected from 2010 through 2015.

The BPE model was created by INRS on behalf of the North East State Foresters Association through grant support from the USDA Forest Service. The BPE tool is intended to be used as a decision support tool for analyses of wood supply under different conditions for a geographic area. Using FIA data as its core dataset, BPE estimates available timber volumes over time for a specific geographic area based on a series of parameter assumptions. The tool's interface allows for a large number of different model runs. For this project, we have chosen a small number of likely potential futures given certain parameter choices further described in the next section.

Ownership Category	Total Acres of Timberland	Accessible Acres	
Federal	83,939.71	0.00	
State	397,761.51	218,768.83	
Municipal	105,010.32	52,505.16	
Corporate	292,807.62	263,526.86	
Farm	117,123.05	58,561.52	
Other Private:			
Parcels 1-10acres	1,089,244.34	217,848.87	
Parcels 11-20 acres	1,633,866.50	816,933.25	Net Accessible
Parcels 21+ acres	2,723,110.84	2,178,488.67	Timberland:
Total:	6,442,863.89	3,806,633.16	3,631,528.03
	2	Percent Discour	nt: 43.6%

TABLE 2. ACREAGES FOR ALL MODEL RUNS AFTER APPLYING ASSUMPTIONS



ANCA and its partners are concerned about sensitive resources in the region's forests under a future where the forest product industry harvests more timber in the region than today. The significant discount in available acres resulting from the various model run assumptions chosen below are designed to provide for a conservative approach and a significant acreage "buffer" to account for the interest in conserving these sensitive resources. These assumptions, as seen in acreage es in Table 2, remove 44% of the available timberland base from consideration in the model run results.

The assumptions used for the model runs, subject to modifications described for each model run, are found in Figure 29 below.

General			Private Timberland O	wnership Pro	oportions		
% of total standing bo	olewood	6506	% Corporate	5.0%			
folume that is low gra	ade:	0370	% Farm	2.0%			
6 of total sawtimber alue (sawlog quality	harvest that is high-):	50%	% Other Private	93.0% -	% Other Private: 1-10acre parcels 20.09		
% of tops and limbs i suitable/sustainable	inventory that is to extract for chipping:	75%			% Other Private: 11-20acre parcels	30.0%	
					% Other Private: 21+acre parcels	50.0%	
Physical Factors Li	miting Access		Ownership Impact on	Accessibility	/		
Slope	0.5%		Federal		0.0%		
Elevation	0.5%		State	5	55.0%		
Wetlands	0.5%		Municipal	5	50.0%		
Distance to Roads	1.5%		Farmer	5	50.0%		
Deer Yards	0.0%		Corporate	9	90.0%		
Stream Buffers	1.0%		Private Parcels 1-10 ac	res 2	20.0%		
Easements	0.5%		Private Parcels 11-20 a	acres	50.0%		
Other	0.1%		Private Parcels 21+ acr	res	80.0%		
Total % Physically Inaccessible Acres:	4.60%						

FIGURE 29. ALL BPE MODEL RUNS ASSUMPTIONS



In the figures below, the results of model runs are shown graphically followed by available timber volume summaries and then a graphic summary for all model runs at the end of this section.

RUN 1: Constant or business as usual – In this model run, it is assumed that timberland acreage stays the same as today, that harvest levels are the same as today and that forest growth stays the same as today. This run represents the "business as usual" run where the projections are based on the current situation in the region.



FIGURE 30. BPE MODEL RUN 1 RESULTS – BUSINESS AS USUAL

Available timber volume per year (Accessible Growth) in 2016 – 1,248,000 green tons Available timber volume per year in year 2036 – 2,925,000 green tons



RUN 2: Reduced growth run – This is a pessimistic run and assumes that wood use remains constant but that forest growth is reduced by .2% per year (compounded) over the run period. This choice reflects factors such as insects and diseases (e.g., hemlock wooly adelgid, emerald ash borer) or invasive plants and their possible future effects on forest growth. The land acreage available for timber harvesting with this run are the same as Run 1 above.

Note: this is a major reduction in growth. A more likely future scenario in the next 20 years is found in Run 4 – Increased Growth.



FIGURE 31. BPE MODEL RUN 2 RESULTS – REDUCED GROWTH - PESSIMISTIC

Available timber volume per year in year 2016 – 1,248,000 green tons Available timber volume per year in year 2036 – 2,595,000 green tons

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RUN 3: Increased demand run – This run assumes an annual harvest level or wood use increase of .5% (compounded) in the Region while keeping growth and mortality at current levels. The land acreage available for timber harvesting with this run is the same as BPE Runs 1 and 2.



FIGURE 32. BPE MODEL RUN 3 RESULTS – INCREASED DEMAND

Available timber volume per year in year 2016 – 1,248,000 green tons Available timber volume per year in year 2036 – 2,429,000 green tons



RUN 4: Increased forest growth run – This run assumes an annual forest growth increase of .2% (compounded) in the Region while keeping harvest and mortality at current levels. The land acreage available for timber harvesting with this run is the same as Run 1, 2 and 3 above for the run. This model run projection was chosen because early signs of climate change indicate that the forests of the northeast U.S. are increasing their annual growth due to the longer growing seasons as compared to 50 years ago.



FIGURE 33. BPE MODEL RUN 4 RESULTS – INCREASED FOREST GROWTH

Available timber volume per year in year 2016 – 1,248,000 green tons Available timber volume per year in year 2036 – 3,272,000 green tons

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RUN 5: Increased forest growth and increased demand run – This combines the assumptions in Runs 3 and 4 so it assumes an annual forest growth increase of .2% (compounded) in the Region while increasing harvesting .5% per year (compounded). The land acreage available for timber harvesting with this run is the same as Run 1, 2, 3 and 4 for the run. This model run projection was chosen by the steering committee advising the project since it is the goal of the project to increase wood use in the region. This run might be considered the "preferred" run of the five chosen.



FIGURE 34. BPE MODEL RUN 5 - INCREASED GROWTH & INCREASED DEMAND

Available timber volume per year in year 2016 – 1,248,000 green tons Available timber volume per year in year 2036 – 2,773,000 green tons







V. TIMBER EXPORTS FROM NEW YORK

As part of this analysis, Innovative Natural Resource Solutions, LLC has researched historical data on timber exports. Unfortunately, no data sets on timber exports allow for filtering for just the 14-county area of New York that is the subject of this study. The following timber export data cover the entire State of New York.

Although not part of the original scope of work for this project, INRS has researched the export of timber from New York State at the request of the project leadership. The data sources do not allow for segregating out timber harvested only in the 14-county region of the State, but the data is useful nevertheless.

Figure 36 data comes from a series of reports for the states of New York, Vermont, New Hampshire and Maine from the North East State Foresters Association. The state foresters of these four states have periodically produced reports that quantify the economic value of the forest-based economies of the states individually and as a region. These reports have also included data and information on the harvests, processing and export and import of timber products called "wood flows."

From this information, we have excerpted timber exports from New York from four reports produced since 1997.





Source: North East State Foresters Association from various sources

The information above includes all timber exports from New York to neighboring states, Canada, other locations in the region or internationally.



Additionally, the New York Department of Environmental Conservation has purchased export data showing the export of timber from the State to Quebec, its closest Canadian province. Figure 37 shows that pulpwood and sawlog exports to Quebec are now over 125,000 cords per year. As evidenced in the graph, these exports seem to have increased since the recession.





Source: Statistics Canada

It is important to put import and export of timber in perspective. While we would all like to see value added locally to raw timber harvested in New York, thereby providing local jobs and generally circulating money in the local economy, the reality is that timber and wood products are traded regularly across state and country lines – especially with neighboring states like Canada. Since transporting high-weight lower-value products such as timber is expensive, we would expect that these raw materials would trade in region, regardless of state and country political boundaries, especially if the markets to which the raw material moves are nearby. Such is the case with timber harvested in New York.

Despite that economic fact, a great deal of the timber harvested in New York is manufactured further in New York as evidenced by Figure 36 data.



VI. CYCLICAL NATURE OF MARKET DEMAND

Within the 14-county region, there are a number of markets for low-grade wood. The largest and longest-standing markets are pulp and paper mills, which purchase roundwood and clean chips in order to manufacture paper. Additionally, the region has two currently operating biomass electric facilities (plus a now closed unit in Chateauguay) and four wood pellet manufacturing facilities. Though dispersed, there is also a significant market for firewood in the region, which utilizes the same feedstock.

In addition to these facilities, a number of other markets draw wood from this region – some on a consistent basis, and some when their demand or local supply dynamics dictate.

Figure 38 shows major markets for low-grade wood (non-sawlog material) in the ANCA Region.

Pulp & Paper Mill Biomass Electricity Wood Pellet

FIGURE 38. MAJOR MARKETS FOR LOW-GRADE WOOD, ANCA COUNTIES



Some markets are particularly sensitive to changes in other sectors or prices for competing products. For example, biomass electricity, wood pellets and firewood are all energy products. Changes in the wholesale cost of electricity can occur because of changes in the cost of natural gas (often the fuel setting the grid price in ISO-New York), or changes in electricity demand. When the price of electricity drops, biomass generation facilities may find themselves unable to compete on the spot market, and may decrease or cease production.

Similarly, both wood pellets and firewood are used for space heating – either as primary heating or as supplemental heat. Many consumers who use these fuels have heating options (for example, an oil boiler and a wood pellet stove), and can choose to use fuels based upon their heating costs. Additionally, abnormally warm or cold periods can cause unanticipated changes in demand for wood heating fuels.

Figure 39 shows how the prices of wholesale electricity and home heating oil have changed in New York since the beginning of 2014. Changes like the ones shown below can cause significant decreases in the demand for wood in certain markets, which the region has reportedly experienced.



FIGURE 39. ENERGY MARKETS THAT INFLUENCE MARKETS FOR LOW-GRADE WOOD,



Markets have natural cycles, but the logging and trucking supply infrastructure are often not sufficiently nimble to adjust to changing market conditions in real time. For example, a number of markets reported that they had very significant challenges securing adequate wood supply during the winter of 2014-2015. At that time, the pulp and paper mills were operating at normal (steady) capacity, the region's pellet mills were operating at capacity, the biomass electric facility in Lyonsdale was operating, and a new biomass electricity unit came online in Watertown. A number of loggers report to us that they were also selling pulpwood to markets in Pennsylvania, Maine and Canada – mills that were having their own challenges in securing supply – and going further afield to purchase feedstock.

A year and a half later, the situation is very different. While the pulp mills continue with a steady consumption, wood pellet mills have reduced production (in response to low oil prices and reduced demand given excess inventory from last year's warm winter), firewood sales are low (for the same reasons), and the biomass electricity facilities have paused operations during periods of low electricity prices or reduced production when operating. Less production of finished goods – paper, pellets, electricity, and cordwood – means less demand for wood. Additionally, the recent closure of several pulp mills in Maine has decreased competition for fiber in areas of Vermont and New Hampshire that have traditionally supplied both New York and Maine mills.

FIGURE 40. MARKET CONDITION SUMMARY, WINTER 2015 AND FALL 2016

Winter 2015	Today
 Pulp mills operating at normal capacity Electricity prices high biomass plants operating as much as they can New biomass plant at Black River Oil prices high Strong demand for wood pellets Strong demand for firewood Pulp mills from PA, ME and Canada all looking for wood in the region Markets wide open 	 Pulp mills operating at normal capacity Electricity prices low Seasonal curtailments and operation below capacity at biomass plants Oil prices low Low demand for wood pellets and firewood Latent supply left from a warm winter Other regions not pulling wood from the Adirondacks Markets on quota

Most loggers and market representatives we spoke to in the region reported that they were currently on quotas which limit the volume of wood that they can bring to a given facility. This is a dramatic change from a few years ago, when all of these markets (and more) were concerned about wood availability.



VII. LOGGING AND TRANSPORTATION INFRASTRUCTURE

Innovative Natural Resource Solutions LLC (INRS) had conversations with roughly two dozen market participants to gain perspective on the logging and trucking infrastructure in the region. We asked a number of open–ended questions to better understand perspectives from loggers, truckers, landowners, wood-using industries and others in the industry. A list of the questions asked as part of the interview process is included in Appendix D.

NEED FOR MORE LOGGING CAPACITY IN THE REGION

As discussed above with regard to mill quotas, there is sufficient logging capacity to meet the region's current demand. Most markets are currently limiting how much wood suppliers can bring them, and loggers are concerned that prices are insufficient to sustain long-term operations. In our conversations with market participants, all acknowledged that the immediate situation does not demand more logging capacity, and some suggested it demands less. However, a common theme in our conversations was that a return to strong markets would strain the supply chain.

These questions often elicited a more important conversation. While there are and have always been swings in the markets for forest products, the supply chain eventually reacts to market changes – either through expansion or contraction. However, as discussed in greater depth below, a real concern was expressed not about logging capacity today or two years ago. The concern identified was for +/five years from now, when it appears a significant portion of the region's logging capacity will retire and exit the business with older equipment. If a significant portion of the current capacity exits the market, mills will struggle to harvest and deliver wood, and this will challenge the economics of continued operation or investment.

While nobody expressed concerns about lack of logging and trucking capacity given current market conditions, there is a very real concern that if markets strengthened there would be a lack of people, iron and trucks to provide for these markets.

CHANGES IN REGIONAL LOGGING CAPACITY

When asked about knowledge of people or firms entering or leaving the logging and trucking industry, most respondents were not aware of new entrants but knew of a few individuals who had left logging. While retirement accounted for some of the loss, more common was the loss of loggers to other industries, notably construction (where some of the heavy equipment operations skills are transferrable) and working as prison guards. A number of respondents were also aware of firms - including one firm that we approached during this study – that were responding to market conditions downsizing on a permanent basis (e.g., going from two crews to one). A number of loggers we spoke to indicated that at this time, they are not making enough money to justify continued operation or investment in the current market and that if markets continue with quotas limiting demand, they may need to consider leaving the business or shrinking operations.

ENCOURAGING YOUTH TO ENTER LOGGING

We inquired whether a respondent would encourage their child to enter logging. This question was designed to cut away the theoretical dialogue about people entering the business and address whether respondents viewed logging as a viable way to make a living. The answer to this question is important because logging has a history as a familial business. Children follow parents (usually sons follow fathers, but not exclusively) into the woods and learn the skills and business by being part of the operation.

Respondents were roughly split on whether they would encourage a child to enter logging. Several loggers were currently working with their sons, and were glad that they had the opportunity to work with and mentor the next generation. Others had actively discouraged their children from entering logging, noting that there are opportunities that are safer and more lucrative using a similar skill set. More than one logger noted that the investment necessary to run a logging crew was not justified given market conditions and that an entrepreneurial individual could find greater reward in other endeavors.

We were unable to find data to indicate whether this level of encouraging children to pursue a logging career is high, low or normal compared to historic attitudes or other industries.



MILL SUPPORT OF NEW LOGGING INFRASTRUCTURE

When mills are concerned about logging infrastructure, there are steps they can take to develop and secure that infrastructure. Decades ago, many mills had their own logging crews, often working on company-owned land. Changes in worker's compensation, sale of company land and a general trend away from vertical integration in the forest industry has meant, largely, an end to "company crews."

Today, mills can support logging infrastructure in a variety of ways. Simply providing a market and paying market prices is a way that mills support loggers, and in the current market, some mills find this sufficient. Other facilities have entered into a Memorandum of Understanding (MOU) with suppliers that outline volume expectations; suppliers then use the MOU to help finance new equipment. One firm, ReEnergy, established an equipment program to help suppliers purchase chippers to serve its new biomass electricity facility at Black River (Watertown). Described in Appendix E, this program finances new equipment for loggers and relies upon debits from wood fuel deliveries as payment.

Additionally, most mills report that they have supported logger training and education and equipment programs (most specifically the NY Logger Training program) in New York, and are active in associations that support industry development.

It is important to note that mills have no obligation to support logging and trucking infrastructure (directly or indirectly) but that many find it in their interest to develop a robust and diverse wood supply. Some efforts – such as the MOUs or equipment programs described above – can help a mill secure wood supply but may also expose the mill to risk in the event of changing market conditions. Most mill operators said they would consider additional steps to support infrastructure development – particularly trucking infrastructure – if it was necessary to secure a wood supply.

ACCESS TO CAPITAL

Every logger we spoke with indicated that they currently have access to capital to finance new equipment, either through local banks or equipment dealers. Based upon our interviews, there is no reason to suggest that access to loans is a barrier to existing logging firms financing expanded operations. However, most loggers indicated that while they had access to money, they had no plans to purchase new equipment and would not do so until market conditions changed or the age of equipment currently in use necessitated replacement.

OPERATING AND TRUCKING LOCALLY

We asked respondents about issues they had with municipalities either harvesting or trucking. While a few loggers expressed frustration with particular towns for being anti-harvesting, the general response was that most towns were neutral to supportive of timber harvesting and that any challenges were known and could be worked around. Respondents viewed trucking the same way – that most roads and bridges were in good condition and that where there were known problems, state and local road crews were working to fix those issues (often causing temporary frustration, as traffic is diverted or delayed while a bridge is fixed).

Seasonal road closings, particularly for mud season in the spring, remain a frustration for loggers and mills, as many roads have weight limits that limit or prohibit trucking during periods when roads are soft. Most respondents noted that this is a long-standing issue and that towns and loggers have found ways to work together (e.g., trucking at night when roads are frozen).

Seasonal access to some lands – particularly public land – was also noted, though again loggers and mills appear to accept this as a known issue and have developed ways to work around any challenge this presents to wood supply.

It is important to note that while suppliers did not report any major problems with local government as it relates to their operations, there was no survey or other research conducted about attitudes of residents and homeowners in the region to determine their attitude toward logging activities.

PAUL SMITH'S COLLEGE – LOGGER TRAINING CENTER

In 2015, Paul Smith's College (Franklin County) received a state grant to develop a logger training center. Noting the need for "a system for training individuals to be in a high-production industry," the New York Legislature allocated funds to develop this program.

This brand new program is very much under development, and there are now opportunities for the forest industry to

partner with Paul Smith's College to shape the program and curriculum in a manner that will benefit both the individuals that participate in the training program and the industry that they will enter.

The training program is focused on mechanized logging (feller-bunchers and grapple skidders). As currently envisioned, the program will be targeted at individuals entering the profession, though there may be opportunities for logger re-training (e.g., moving from harvesting with a chain saw to mechanized harvesting) and professional development.

Paul Smith's College has purchased a mechanical harvesting simulator and a number of experienced loggers in the area have operated the unit. There is a consensus with those loggers that the use of the simulator is an excellent way to develop operator skills but that a student will need to also operate "in the woods" before being able to fully contribute to a logging operation.

Paul Smith's College currently envisions the development of a non-degree certificate program, completed in residence over some brief period of time (4-6 weeks, perhaps). Such a certificate program would provide enough education to demonstrate an understanding and proficiency with mechanized timber harvesting operation, while allowing a student to enter the workforce relatively quickly. By utilizing the facilities and timberland at the college, the institution is well positioned to develop a training program that can develop the next generation of loggers.

It should be noted that ongoing training for existing loggers in business in New York occurs through the New York Logger Training program under the auspices of the Empire State Forest Products Association. Full training in all methods of logging – including more traditional chainsaw and skidder operations – also occurs for mechanized operations.

VIII. FINDINGS & RECOMMENDATIONS

This project is focused on the goal of expanding the forest products industry in the Northern New York 14-County area and the subsequent economic and environmental benefits that could result. The research and data development that form the basis for this study results in a series of major findings:

• Of over 8.8 million acres of forestland in the region, there are approximately 3.6 million acres of accessible timberland in the region – land not already restricted from timber harvesting. Of this available acreage, 91% is privately owned;

• This timberland base has grown significantly over the last 100 years and in recent years is relatively stable. The most significant change recently has resulted from the nearly 104,000 acres that have been added to the Adirondack Forest Preserve since 1993 (state ownership) and, as such, have been permanently removed from the timber base;

• Taking into account timberland that is not available for timber harvest for various physical, regulatory and landowner decision making reasons, there are approximately 78 million cubic feet (2.4 million tons) of timber growth each year that are not currently being harvested and are physically available for harvest without reducing the standing forest volume. Current harvests are approximately 4 million tons annually;

• Model runs using the Northern Forest Biomass Project Evaluator show that, due to current timber harvest levels that are significantly below annual growth in the 14-county region, by 2036 as much as 3.2 million additional tons of timber will be available to the timber economy than is available today.

• The region contains or is adjacent to the full suite of forest products markets such that any tree harvested in the region has either a low-value or higher-value market and, compared to many other areas in the U.S., has abundant markets for forest products;

• The supply chain infrastructure to move timber to market that includes harvesting and trucking is in place in the region with dozens of individual companies and hundreds of individuals working in those sectors;

• The harvesting and trucking infrastructure is adequate



to supply the existing forest products markets at their current demand level;

• The harvesting and trucking infrastructure is inadequate to supply the existing forest products markets at increased demand levels such as those experienced as recently as the winter of 2014-15. This logging and trucking workforce is also aging, which suggests future constraints can be expected.

As a result of these findings, and taking into account the overall project goal of seeking to expand the forest products industry in the 14-County region, the following are recommendations that forest stakeholders in New York should work towards:

1. SUSTAIN AND GROW THE FOREST PRODUCTS MARKETS THAT EXIST TODAY

A classic tenet of economic development is to make sure you keep the economic activities that currently exist because they are providing the economic benefits of jobs, taxes and local cycling of money, and it is difficult to get them back once lost. In the case of the forest products industry in this region, which is significant and relatively robust, maintaining this economic activity and infrastructure should be paramount in forestry stakeholders' and State efforts. This is especially true because some of the existing forest products markets are facing challenges at this time.

Today, there are two electricity plants using forest-derived wood chips as fuel in the region and a third just outside the region in Vermont. There are significant stressors affecting all of these plants, along with others in the northeast region. Prices being paid for wholesale electricity have dropped significantly in recent years. This phenomenon has been caused by many issues, especially alternative fossil fuel electricity generation that competes with the wood-fueled plants. As a result, these wood markets, which represent nearly one million tons of wood fuel market annually, are at risk of closure.

The region also contains four wood pellet manufacturing plants that use approximately 500,000 tons of low-value wood raw material per year as feedstock for plant production. These plants have also been stressed in the last year and one-half as a result of low heating fossil fuel prices as well as an extremely mild winter in 2015-16. While capable of rebounding if significant cold weather returns in the coming winter, along with rising fossil fuel prices, these plants are facing economic challenges at this time. Firewood markets, which represent over one million cords per year for all of New York, according to the New York Division of Lands and Forests, have also been affected significantly by these phenomena.

Two pulp and paper mills that use wood as feedstock for the pulp and paper-making process are also located in the study area. Since 1999 in the northeast, particularly in New York, New Hampshire and Maine, 11 of 17 pulp and paper mills have closed operation due to the reduction in the worldwide market for pulp and paper, as well as the competitiveness and product mix of particular facilities. Two of these closures were in New York. The two remaining pulp and paper mills in New York are fortunate in that their product mix is better positioned than most of the plants that have recently shut them down. Despite this, these plants are subject to the reduction of worldwide demand phenomenon, and continued operations should not be taken for granted.

The region also contains over 30 sawmills that utilize the higher value logs that come from the harvest of timber in the area. Since the recession that began in 2008-09, this sector has recovered and continues to be strong, given strong demand of their lumber products. This sector is extremely important to the forest landowner component of the supply chain in the region, since these markets pay the forest landowner significantly more than firewood, wood pellets, pulp and paper when the timber is sold.

Lastly, the timberland base itself is extremely important to the future health of the forest products industry. The accessible timberland is 91% privately owned and is relatively stable and large. The markets timberland owners depend on are currently robust and relatively stable. The State of New York should focus on actions that help retain the private timberland base and its accessibility to support these markets.

Collectively, the stresses on the existing forest products markets in the region demand action to ensure their continued (or re-started) operation. New York forest stakeholders should make this a primary focus of future efforts.



2. ENCOURAGE FOREST PRODUCTS MARKETS TO POSITIVELY INFLUENCE THE LOGGING AND TRUCKING INFRASTRUCTURE

Perhaps the most significant impacts, both positive and negative, that can affect the forest products supply chain logging and trucking businesses are the actions of the forest products markets themselves, i.e. the pulp and paper, biomass electricity, wood pellet, firewood and sawmill businesses. Having a market for forest-derived timber is the heart of the logging and trucking businesses and jobs these sectors contain.

Nearly as important as the markets themselves are the manner in which the relationships between the markets and the logging and trucking businesses are conducted. Particularly important are those periods where the demand for the manufactured products from these markets are reduced and/or the times when the logging production (supply) is more than the demand can handle. During these times of quotas - whereby the markets limit the amount of harvested products they allow producers to deliver to their facilities over a period of time – it can be very stressful to the producing loggers and truckers, who count on steady income to cover labor costs and debt service for their business equipment. Care and close communication between markets and their suppliers is essential to ensure that the producers are able to keep their businesses operating during and after these constrained market periods.

The point here is that the markets themselves and how they interact with the businesses that supply their raw material can, depending on the approaches used, either add to the economic health of the supply businesses or detract from it.

3. SUSTAIN AND GROW APPROPRIATE STATE INVESTMENT IN THE FOREST PRODUCTS INDUSTRY

• Conservation Easements: The State of New York investment in working forest conservation easements in the 14-County area – over 700,000 acres worth since 1993 – has been important to maintaining the timberland base available for harvest. While some might suggest that these conservation easement lands produce less timber than private forestland without easements, there is no direct evidence that supports this premise. Research on this topic shows no cause and effect. The state should continue to prioritize investment in Working Forest Conservation Easements. In addition, land trust Working Forest Conservation Easements should be explored as an option when New York land trusts are working with timberland owners.

• Capital Grants: Additionally, the New York Capital Grants program has made investments in forest products industry market businesses with positive results. When these investments have been made in this industry, however, they have generally been limited to the manufacturing facility only and not to the related timber supply infrastructure. It is recommended that comparable investment be made in the timber supply infrastructure along with the manufacturing investment.

• Private Forest Owner Carrying Costs: New York State should help address private landowner carrying costs through property tax policy and cost-share programs. In addition, landowner outreach and education programs should be supported.

4. SUSTAIN AND EXPAND NEW YORK'S INVOLVEMENT IN LOGGER TRAINING PROGRAMS

The recent state appropriation to Paul Smith's College toward a modern logger training program is a good example of a number of significant opportunities to address a logging workforce that is not large enough to handle surges in demand like that experienced in the winter of 2014-15 or any other significant increased demand. The NY Logger Training (NYLT) program and SUNY ESF logger training programs at the Ranger School, in addition to the Paul Smith's program, are critically important. These are the mechanisms that will address the likely reduction in the workforce due to aging of logging personnel in the region.

Since the Paul Smith's program is in its infancy, there is a great opportunity for the industry to help the College to design and develop the program to ensure it provides training that is most relevant to the needs of the logging/ trucking businesses in the forest products industry in the region. It is recommended that selected members of the forest industry ask to partner with Paul Smith's to ensure that result.

It is recommended that all players in existing forest products markets in the region think carefully about the relationship they have with their forest products suppliers with a view to the long-term health of the suppliers and industry as a whole.





CLOSING NOTE ON DATA AND INFORMATION

Data and information about the forests and forest businesses in the 14-County region are the heart of this study. There is always a need for better data sources to ensure conclusions in a report such as this are based on the best and deepest data and information available for the forest area in question. INRS used the best data and information about this region that it could find. While FIA from the USDA Forest Service formed the basis for the forest and timberland analyses, these data could be more robust. For instance, understanding trends and changes over time with screens such as parcel size would allow more in-depth analysis. INRS acknowledges the challenges to improving the forest resources data and information from FIA and encourages the Forest Service to find ways to make the data even more robust in the future.

SOURCES

Analysis of Wood Resource Availability in the Northeast U.S., Hushaw, Jennifer and Ducey, Mark, Northeastern States Research Cooperative funded project, 2016 (www. nefainfo.org)

Harvard Forest, forest cover dataset for northeast U.S.

North East State Foresters Association, Wood Flow reports, 1997 to 2011

Northern Forest Biomass Project Evaluator, NEFA, 2013

Statistics Canada, data on log exports from New York to Canada

Telephone interviews with numerous forest products supply chain business owners

USDA Forest Service Forest Inventory and Analysis, Evalidator data source

Endnotes below – these contain many additional sources that are not repeated here.





APPENDICES

APPENDIX A - PHONE INTERVIEWS CONDUCTED WITH:

Sean Ross, The Lyme Timber Company LP Timothy Burpoe, The Molpus Woodlands Group, LLC Wayne Tripp, F&W Forestry Services Inc. Tony Woods, New England Wood Pellet Wayne Majuri, International Paper Michael McLarty, Finch Forest Management, Finch Paper LLC Aaron Zieman, Adirondack Park Agency (APA) Tom Martin, New York Department of Environmental Conservation (NY DEC)

Sloane Crawford, NY DEC

Justin Perry, NY DEC Paul Mitchell, Paul J. Mitchell Logging Walt Chandler, Walter E. Chandler Forestry Services LLC Jim Peck, James M. Peck Logging, Inc. Floyd Peets, FJ Peets & Son Logging George Wheldon, George Wheldon Logging Herb and Deb Boyce, Northwoods Forest Consultants, LLC Jim Reynolds, James Reynolds Logging Mike Kraszewski, Red Rose Timber & Transport LLC John Levi, Payne & Levi Sawmill, Inc. Tim O'Neill, O'Neill Brothers Logging Mike Buckley, ReEnergy Holdings LLC David Falkenham, Paul Smith's College



APPENDIX B - TREE GRADE DESCRIPTIONS

Code	Description
1	 Preferred – Live tree that would be favored in cultural operations. Mature trees, that is, older than the rest of the stand; has less than 20 percent total board-foot cull; is expected to live for 5 more years; and is a low risk tree. In general, the tree has the following qualifications: must be free from "general" damage (i.e., damages that would now or prospectively cause a reduction of tree class, significantly deter growth, or prevent it from producing marketable products in the next 5 years).
	 should have no more than 10 percent board-foot cull due to form defect. should have good vigor, usually indicated by a crown ration of 30 percent or more and dominant or co-dominant. Usually has a grade 1 butt log.
2	Acceptable – This class includes:
	 live sawtimber tree that does not qualify as a preferred tree but is not a cull tree (see Rough and Rotten Cull). live poletimber tree that prospectively will not qualify as a preferred tree, but is not now or prospectively a cull tree (see Rough and Rotten Cull).
3	Rough Cull – This class includes:
	 live sawtimber tree that currently has 67 percent or more predominantly sound board-foot cull; or does not contain on merchantable 12-foot sawlog or two non-contiguous merchantable 8-foot sawlogs. live poletimber tree that currently has 67 percent or more predominantly sound cubic-foot cull; or prospectively will have 67 percent or more. predominantly sound board-foot cull; or will not contain one merchantable 12-foot sawlog or two noncontiguous merchantable 8-foot sawlogs.
4	Rotton Cull – This class includes:
	 live sawtimber tree that currently has 67 percent or more predominantly unsound board-foot cull. live poletimber tree that currently has 67 percent or more predominantly unsound cubic-foot cull; or prospectively will have 67 percent or more predominantly unsound board-foot cull.
5	Dead – Tree that has recently died (within the last several years); but still retains many branches (including some small branches and possibly some fine twigs); and has bark that is generally tight and hard to remove from the tree.
6	Snag – Dead tree, or what remains of a dead tree, that is at least 4.5 feet tall and is missing most of its bark. This category includes a tree covered with bark that is very loose. This bark can usually be removed, often times in big strips, with very little effort. A snag is not a recently dead tree. Most often, it has been dead for several years – sometimes, for more than a decade.

Excerpted from:

Woudenberg, Sharon W.; Conkling, Barbara L.; O'Connell, Barbara M.; LaPoint, Elizabeth B.;

Turner, Jeffery A.; Waddell, Karen L. 2010. The Forest Inventory and Analysis Database:

Database description and users manual version 4.0 for Phase 2. Gen. Tech. Rep. RMRSGTR-245.

Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain

Research Station. 336 p.



APPENDIX C – SPECIES IN EACH SPECIES GROUP

Eastern white and red pines red pine eastern white pine Spruce and Balsalm fir balsam fir Norway spruce white spruce black spruce blue spruce red spruce Eastern Hemlock eastern hemlock Other eastern softwoods redcedar/juniper spp. eastern redcedar tamarack (native) Douglas-fir northern white-cedar Select white oaks white oak swamp white oak bur oak Select red oaks northern red oak Hickory bitternut hickory pignut hickory shagbark hickory Yellow birch yellow birch Hard maple sugar maple Soft maple red maple silver maple Beech American beech Ash white ash black ash green ash **Cottonwood and aspen** balsam poplar eastern cottonwood bigtooth aspen quaking aspen Basswood American basswood

APPENDIX D - INTERVIEW QUESTIONS

Intro before starting interview – "We are working for ANCA to determine if there is an opportunity to grow the forest products industry in the 14 northern NY counties. Critical to this work is to understand the challenges and opportunities that exist within the industry supply chain today. The following questions are designed to help us understand key issues facing the industry."

1. Do you see a need for more loggers/forest products truckers in the region?

a. Operators or owners?

b. Have you seen the need change in the past five years? 10 years?

c. How many people do you know personally that are:

i. Expected to leave logging in the next year?

ii. Expected to start logging in the next year?

d. Would you encourage your child to go into logging?

e. Do you think existing and projected market conditions warrant the need for additional logging capacity?

2. For procurement staff/mills -

a. What are the specific challenges you face regarding logger availability?

b. What are the specific challenges you face regarding trucking availability?

c. Have you added new suppliers in the past two years?

i. What percentage of supply do they represent?

d. Have you lost suppliers in the past two years?

i. Why?

ii. What percentage of supply did they represent?

e. Are there seasonality issues you face?

f. When was the last time your mill ran out of wood?

i. What caused this?

g. When was the last time you had suppliers on quota?

h.What 3rd party certifications do you require? Encourage?

i. What steps have you (mill) taken to build/support supply infrastructure?

j. What could existing suppliers do to better support mills (excluding price)?

Northern New York's Forests: Timber Supply, Workforce, Infrastructure & Markets www.adirondack.org





3. For loggers/truckers

a. Describe crew and equipment

b. Weekly production (loads, or other)

c. Has your productivity changed in the past five years? i. If yes, why?

d. Is there an investment in equipment you would like to make?

i. What would you purchase?

ii. Why have you not made the purchase?

e. Have you tried to add staff in the past two years? i. Describe how that went

ii. Were they trained in a formal program – if so which one?

iii. Are there skills gaps when trying to hire loggers?iv. Are there skills gaps with your existing staff?v. Do you have experience with formal training programs? On-the-job training? Thoughts?vi. What kind of training programs (that are not currently available) would you like to see offered by trade associations, colleges, etc?

vii. Do you run an internship program in your firm? Have you considered one?

f. Have you lost staff in the past two years? i. Where did they go?

ii. Are they using skills they learned logging?iii. Do you expect any retirements in the near future?

iv. Do you conduct season layoffs (mud season), and if so do you get staff back?

g. Are there particular roads/bridges that you have challenges with?

h. Are there particular local ordinances/regulations of either logging or trucking that you find over burdensome? Which community specifically?

i. Describe seasonal challenges for harvesting and transporting wood

j. What 3rd party certification systems do you participate in? (FSC, SFI, Tree Farm)?

i. Has this had any impact on your production? k. If you are the owner of the business, how old are you? l. Have you made succession plans for your business? m. What could existing markets do to better support suppliers (excluding price)?

4. Who else should I talk to?

5. Is there anything else you want to add?

APPENDIX E

FINANCING OF BIOMASS PRODUCTION EQUIPMENT

The following is adapted from a case study INRS and R.E. Consulting prepared highlighting the way one biomass firm uses equipment financing to strengthen their supply chain. This case study, prepared for the Massachusetts Technology Collaborative (2007), examines the practices of Boralex, a firm that then owned six wood-fired power plants in Maine and New York. ReEnergy Holding has since purchased those facilities and has further refined this equipment program.

The financing program is a "lease to buy" agreement, where payment is based on wood deliveries (i.e., \$/ton). The program is available to any reputable contractor who is interested in establishing an in-woods biomass processing operation. Each agreement is tailored to meet the mutual needs of the contractor and the facility. The agreements are governed by a contract that states the annual volume to be delivered to the biomass facility and respective prices. The typical contract length is five years with an annual volume of approximately 50,000 to 60,000 tons. The annual volume is expected to be delivered in a 40 week time period. Volume obligations and delivered prices are renegotiated annually to provide flexibility for the contractor and the power plant. The contractor is responsible for negotiating the purchase price with the equipment dealer, and the power plant pays the invoice for the machine plus the cost of the manufacturer's recommended parts inventory.

Under the terms of the agreement, the contractor pays back the principal and interest at 7.0%, through wood deliveries. The contractor is not required to make an equipment payment if they do not deliver wood. When a load of chips or hog fuel is delivered, a dollar per ton amount (e.g., \$2.50/ton) is withheld from payment to the contractor and credited towards money owed on the machine (see table below). With prior approval from the power plant, the contractor can use the equipment for deliveries to competing facilities; however, the contractor is required to make the same dollar per ton equipment payment to the power plant on the volume. The ownership title transfers to the contractor and payment withholding ceases when the money owed equals zero. Once the contractor owns the machine, they are still required to fulfill their annual volume obligation for the remaining term of the contract, but they do not need the power plant's prior approval to make deliveries to other wood-fired power plants.

The contractor has the option to forfeit the agreement prematurely; however doing so eliminates all accrued ownership in the financed equipment. If the wood-energy industry becomes uncompetitive and all of the power plant's wood-energy facilities close, a force majeure clause would be triggered, thus elevating the obligation for the contractor to continue to make equipment payments. In the occurrence of such an event, the contractor has the option to pay the remaining balance on the equipment liability, however they are not required to.

The contractor is required to pay for inland marine insurance and all operating costs (e.g., labor, maintenance and repair, fuel, etc.) associated with the financed machine. The contractor is also directly or indirectly (i.e., via subcontractors) responsible for the ownership and operating costs related to loading (e.g., excavator, loader on crane carrier, etc.), transport (e.g., tractor trucks, chip vans, etc.), and any support equipment/assets (e.g., pickup truck, garage, etc.). The wood-fired power plant pays a diesel fuel surcharge based on the prior month's fuel price movement. The Energy Information Administration's "weekly retail on-highway diesel price" data is used to determine the surcharge.

Boralex indicated that while the program requires more oversight, communication, and financial risk than traditional means of procuring wood material, it sends a message to their contactors/suppliers that they want a long-term relationship with them. Four contractors have already reused the program, thus indicating they are pleased with the arrangement.

TABLE 3. CASH FLOWS W/ FACILITY FINANCING OF BIOMASS EQUIPMENT (EXAMPLE)

Load #										
	Price per Delivered Ton		Eq Pa p	uipment ayment er Ton	Volume (Tons)	R	Total evenue	Eq Pi	uipment ayment	Money Owed on Equipment
										\$ 300,000
1	\$	24.00	\$	2.50	30	\$	720	\$	75	\$ 299,925
2	\$	24.00	\$	2.50	27	S	648	\$	68	\$ 299,858
<u>v3</u>	\$	24.00	\$	2.50	28	S	672	\$	70	\$ 299,788
4	\$	24.00	\$	2.50	29	\$	696	\$	73	\$ 299,715
5	\$	24.00	\$	2.50	30	S	720	\$	75	\$ 299,640
6	\$	24.00	\$	2.50	32	\$	768	\$	80	\$ 299,560
7	\$	24.00	\$	2.50	26	S	624	\$	65	\$ 299,495
8	\$	24.00	\$	2.50	28	\$	672	\$	70	\$ 299,425
9	\$	24.00	\$	2.50	30	\$	720	\$	75	\$ 299,350
10	\$	24.00	\$	2.50	31	\$	744	\$	78	\$ 299,273



ENDNOTES

ⁱ The FIA definition is "Timberland: Forest land producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization (formerly known as commercial forest land)." http://www.fs.fed.us/ne/fia/methodology/ def_qz.htm

ⁱⁱ The FIA definition is "Horizontal distance to improved road code. The straight-line distance from plot center to the nearest improved road, which is a road of any width that is maintained as evidenced by pavement, gravel, grading, ditching, and/or other improvements. Excerpted from The Forest Inventory and Analysis Database: Database Description and Users Guide Version 1.7, http://www.fia. fs.fed.us/library/database-documentation/historic/ver1/ FIADB_v17_021804.pdf

ⁱⁱⁱ The FIA definition is: "Growing-stock volume: Net volume, in cubic feet, of growing-stock trees 5.0 inches d.b.h. and larger from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. Net volume equals gross volume less deduction for cull." http://www. fs.fed.us/ne/fia/methodology/def_ah.htm

^{iv} For all FIA data runs: Miles, P.D. 2016. Forest Inventory EVALIDator web-application Version 1.6.0.03. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps. fs.fed.us/Evalidator/evalidator.jsp]

^v The FIA definition is "Mortality: The estimated net volume of growing-stock trees at the previous inventory that died from natural causes before the current inventory (divided by the number of growing seasons between surveys to produce average annual mortality)." http://www.fs.fed.us/ ne/fia/methodology/def_ip.htm

^{vi} The FIA definition is "Removals: The net growing-stock volume harvested or killed in logging, cultural operations (such as timber stand improvement) or land clearing, and the net growing-stock volume neither harvested nor killed but growing on land that was reclassified from timberland to noncommercial forest land or nonforest land during the period between surveys. This volume is divided by the number of growing seasons to produce average annual removals." http://www.fs.fed.us/ne/fia/methodology/ def_qz.htm ^{vii} The 1993 Forest Inventory and Analysis is the oldest data set available using the online tool EVALIDator.

^{viii} The FIA data referenced here as "2006" was collected from 2002 – 2006.

 $^{\rm ix}\,$ The FIA data referenced here as "2014" was collected from 2010 – 2014, and is the most recent data available.

^x The FIA definition is "Sawlog: A log meeting regional standards of diameter, length, and freedom from defect, including a minimum 8-foot length and a minimum top diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods." http://www.fs.fed.us/ne/fia/methodology/ def_qz.htm

^{xi} The FIA definition is "Board foot: A unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent." http://www.fs.fed.us/ne/fia/methodology/ def_ah.htm.

^{xii} The FIA definition is: "Growing-stock volume: Net volume, in cubic feet, of growing-stock trees 5.0 inches d.b.h. and larger from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. Net volume equals gross volume less deduction for cull." http://www. fs.fed.us/ne/fia/methodology/def_ah.htm

 ^{xiii} For all FIA data runs: Miles, P.D. 2016. Forest Inventory EVALIDator web-application Version 1.6.0.03. St. Paul, MN:
 U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps. fs.fed.us/Evalidator/evalidator.jsp]

^{xiv} The FIA definition is "Sawlog: A log meeting regional standards of diameter, length, and freedom from defect, including a minimum 8-foot length and a minimum top diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods." http://www.fs.fed.us/ne/fia/methodology/ def_gz.htm

^{xv} The FIA definition is "Board foot: A unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent." http://www.fs.fed.us/ne/fia/methodology/ def_ah.htm.



Factors Influencing the Timber Harvest Intentions of Nonindustrial Private Forest Owners

Authors: Young, Robert A.; Reichenbach, Michael R.

Source: Forest Science, Volume 33, Number 2, 1 June 1987, pp. 381-393(13)

ABSTRACT:

Intentions of woodland owners to harvest timber were examined in an effort to increase understanding of the factors that influence wood production on nonindustrial private forests. Six-hundred-twenty-one randomly selected woodland owners were interviewed by telephone to determine their attitude and beliefs about harvesting timber, and the influence of "important others" in making harvest decisions. Responses were compared for those owners who intended to harvest timber within the next 10 years with those who had no intention to harvest. Attitudes and subjective norms accurately predicted intentions to harvest (R = .75). Standard regression coefficients indicate that intentions were more influenced by the owner's attitude than by the influence of social groups. Differences in beliefs and in the influence of social groups were observed between those who intended to harvest and those respondents who did not. Recommendations are made that would increase the number of owners who intend to produce wood products from their private woodlands. For. Sci. 33(2):381-393.

An Evidence-Based Review of Timber Harvesting Behavior among Private Woodland Owner

Authors: Silver, Emily J.; Leahy, Jessica E.; Weiskittel, Aaron R.; Noblet, Caroline L.; Kittredge, David B.

Source: Journal of Forestry, Volume 113, Number 5, September 2015, pp. 490-499(10)

Publisher: Society of American Foresters

ABSTRACT:

Abstract: Understanding private woodland owner (PWO) timber harvesting behavior is essential for predicting potential timber supply, as PWOs could be an increasingly important source. This evidence-based review synthesizes more than 100 peer-reviewed articles, government reports, and dissertations from 1970 to 2014 from North America and Europe. Our broad research question was "To what extent is actual PWO timber harvesting behavior understood?" Our objectives were to (1) identify how past research analyzed actual harvesting behavior, (2) describe the evolution of these methods, (3) determine the extent

to which previous research linked landowners' stated intentions to actual harvesting behavior, and (4) evaluate the significant predictors of PWO timber harvesting. This evidence-based review found that parcel size, harvest price, and distance from residence were the most common significant predictors of harvesting intention. Many studies purportedly studied behavior, but most measure stated attitudes without measuring observable harvesting behaviors. A better understanding of PWO behavior will inform timber supply prediction and support forest management outreach.

Management and Policy Implications: We present a review of private woodland owner (PWO) timber harvesting behavior that suggests that the PWO decision to harvest timber is not yet well understood. PWOs are an important part of the timber base, particularly in the eastern United States, and their management decisions will have a significant impact on forest ecosystems and the forest products industry. The most reliable predictors of harvesting intention include characteristics such as outreach activity participation and harvest price. Many studies categorized PWOs into typologies, and all studies found that there was a "production-oriented" landowner category. However, only five peer-reviewed studies (6% of the studies examined) that measured actual harvesting behavior were identified. Although many PWOs intend to harvest and those intentions can be measured and used to predict production-oriented individuals, managers are advised to rely on high evidence studies that measure actual behavior to strengthen outreach services and understanding of the true PWO timber availability. Furthermore, state-level policymakers should orient their outreach and incentive programs using actual behavioral studies. State-level forest managers should use behavioral studies in concert with data on volume and age-class distributions to estimate sustainable timber removal levels.

Forest Survey and the Nonindustrial Private Ownerships

Authors: Tarrant, Robert F.; Ewing, Robert A.; Gedney, Donald R.

Source: Journal of Forestry, Volume 76, Number 8, 1 August 1978, pp. 470-472(3)

Publisher: Society of American Foresters

ABSTRACT:

There is need for improving the stratification of forestland through assessment of the socioeconomic circumstances affecting timber production on nonindustrial ownerships. Past research has had difficulty relating the various socio-

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ABSTRACT:

Recently completed forest inventories and woodland owner surveys for each of the six New England states have given us insight into contemporary harvesting activities in the region. About half of the private woodland owners have harvested timber from their holdings at some time in the past. Still, timber harvesting continues to be a fairly concentrated activity. Remeasured plot data indicate that only 30% of the timberland had cutting disturbance between the last two inventories. And two-thirds of the cutting took place on one-tenth of the timberland. Economics more than textbook silviculture determines the kind of cutting that takes place. The good housekeeping associated with better silviculture could result in dramatic improvements in production. Even so, New England's woodlands have held their own and appear to be in relatively good shape. Physical supplies of timber reveal a potential opportunity for significant expansion in wood use. North. J. Appl. For. 7:118-120, September 1990.

Owner Intentions, Previous Harvests, and Future Timber Yield on Fifty Working Nonindustrial Private Forestlands in New York State

Authors: Munsell, John F.; Germain, René H.; Luzadis, Valerie A.; Bevilacqua, Eddie

Source: Northern Journal of Applied Forestry, Volume 26, Number 2, 1 June 2009, pp. 45-51(7)

Publisher: Society of American Foresters

ABSTRACT:

Harvesting on nonindustrial private forestland (NIPF) has increased dramatically in recent years, and projections suggest the trend will continue. Working NIPFs in New York State are not immune to this pressure. Managing these stands to supply a sustained yield of high-quality sawtimber into the future is necessary if working NIPFs are to avoid significant timber stock depletion. In large part, this outcome depends on the intentions of owners and productive potential of their stands. Combining these aspects helps assess whether and how sustainedyield management can be achieved. To demonstrate, we present a case study that used Ajzen's (2005) theory of planned behavior to explain sustained-yield management intentions and Fajvan et al.'s (1998) silviculture classification chart to describe potential yield on 50 recently harvested NIPFs in New York. Predictors of an owner's intention were modeled, and intentions and silviculture classifications were cross-tabulated. Nearly all owners plan to manage

for a sustained yield of sawtimber, but previous cutting will force most to regenerate or convert to uneven-age management to achieve this goal.

Woody Biomass Energy: An Opportunity for Silviculture on Nonindustrial Private Forestlands in New York

Authors: Munsell, John F.; Germain, René H.

Source: Journal of Forestry, Volume 105, Number 8, December 2007, pp. 398-402(5)

Publisher: Society of American Foresters

ABSTRACT:

Data collected from recently harvested even-aged New York nonindustrial private forestlands are used to examine some of the challenges and opportunities associated with expanding woody biomass markets in the context of timber management. Assessments of existing harvesting practices on sampled stands indicate that diameter limit and premature cutting are pervasive. Increases in the demand for woody biomass may exacerbate this exploitive harvesting. However, expanding woody bioenergy markets also might help increase the use of silviculture on these forests by providing much needed small-diameter and low-grade markets. Silvicultural simulations indicate that 6.75 oven-dried tons per acre of woody biomass could have been removed, while simultaneously harvesting a sustainable volume of high-quality sawtimber, leaving an appreciable amount of larger and higher-quality stock for future growth, refraining from premature cutting, and regenerating mature forests.

The Northern Forest Biomass Project Evaluator model was development by Innovative Natural Resource Solutions, LLC for the North East State Foresters Association. A working version can be found at www.nefainfo.org.

^{xvii} A. Milbrandt. A Geographic Perspective on the Current Biomass Resource Availability in the United States. National Renewable Energy Laboratory, Technical Report NREL/TP-560-39181. Prepared under Task No. HY55.2200. December 2005.

xvii http://en.openei.org/w/images/f/f0/Biomass.png

^{xvii} Wakefield, E., PyNe Workshop Report. In: ThermalNet. Issue 04. June 2007.

xvii http://www.robertsbrotherslumberandlogging.com/

^{xvii} Personal communication with Lenny Roberts, December 9, 2015.

^{xvii} A. Milbrandt. A Geographic Perspective on the Current Biomass Resource Availability in the United States. National Renewable Energy Laboratory, Technical Report NREL/TP-560-39181. Prepared under Task No. HY55.2200. December 2005.

xvii http://en.openei.org/w/images/f/f0/Biomass.png

^{xvii} Wakefield, E., PyNe Workshop Report. In: ThermalNet. Issue 04. June 2007.

^{xvii} Given the modest number of plans in some towns,
 INRS cautions against drawing conclusions about forest
 management on a town-by-town level based on this data.

^{xviii} Electricity pricing from: New York Independent System Operator. Monthly Report. July 2016.

 xix Home heating oil pricing from: U.S. Energy Information Agency. Weekly Heating Oil and Propane Prices (October - March) – Central Atlantic, Accessed September 2016. http://www.eia.gov/dnav/pet/pet_pri_wfr_a_EPD2F_PRS_ dpgal_m.htm. Dotted lines are INRS calculations of the trending monthly price during periods when EIA does not collect data.

^{xx} This volume applies to large chippers or grinders. The typical annual volume obligation for a smaller chipper is 10,000 to 15,000 tons.

^{xxi} This equates to an average daily delivery of approximately eight to nine loads.

^{xxii} http://tonto.eia.doe.gov/oog/info/wohdp/diesel_ detail_report_combined.asp

The Adirondack North Country Association (ANCA)

is an independent nonprofit organization working to build dynamic local economies that sustain thriving communities in northern New York. Since 1955, ANCA has leveraged the investment of hundreds of millions of dollars into the region in sectors that drive sustainable local economic development.

Innovative Natural Resource Solutions, LLC (INRS) is a northeast U.S. based natural resource consulting firm that specializes in assisting business, nonprofit and government clients in resolving today's complex natural resource management and business challenges.

The **New York State Wood Products Development Council** is a public-private partnership charged with promoting the economic activity of New York's diverse forest products industries.

The **Empire State Forestry Foundation** works with leaders to effect policy and educate problem-solvers by offering financial aid, supporting research, and advancing public discourse about and understanding of critical forestry issues.

The **Workforce Development Institute** (WDI) is a statewide nonprofit dedicated to improving New York communities through the development of a strong, skilled workforce. Using real-time workforce intelligence WDI provides relevant and timely support that improves the expertise and proficiency of our labor force; our work is aimed at bringing economic stability, opportunity and success to all New Yorkers through workforce development, support and enrichment.

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