

New England Forests: The Path to Sustainability

CHAPTER 8 • CREATE LOCAL JOBS



A TECHNICAL REPORT BY NEW ENGLAND FORESTRY FOUNDATION

INTRODUCTION

This project documents both the existing value and potential of New England's working forest lands: Value – not only in terms of business opportunities, jobs and income – but also nonfinancial values, such as enhanced wildlife populations, recreation opportunities and a healthful environment. This project of the New England Forestry Foundation (NEFF) is aimed at enhancing the contribution the region's forests can make to sustainability, and is intended to complement other efforts aimed at not only conserving New England's forests, but also enhancing New England's agriculture and fisheries.

New England's forests have sustained the six-state region since colonial settlement. They have provided the wood for buildings, fuel to heat them, the fiber for papermaking, the lumber for ships, furniture, boxes and barrels and so much more. As Arizona is defined by its desert landscapes and Iowa by its farms, New England is defined by its forests. These forests provide a wide range of products beyond timber, including maple syrup; balsam fir tips for holiday decorations; paper birch bark for crafts; edibles such as berries, mushrooms and fiddleheads; and curatives made from medicinal plants. They are the home to diverse and abundant wildlife. They are the backdrop for hunting, fishing, hiking, skiing and camping. They also provide other important benefits that we take for granted, including clean air, potable water and carbon storage. In addition to tangible benefits that can be measured in board feet or cords, or miles of hiking trails, forests have been shown to be important to both physical and mental health.

Beyond their existing contributions, New England's forests have unrealized potential. For example, habitats for a wide variety of wildlife species could be enhanced by thoughtful forest management. Likewise, wood quantity could be increased and the quality improved through sustainable forest management. The virtues of improved forest management and buying locally produced goods are widely extolled, but what might that actually look like on the ground? More specifically, how could enhanced forest management make more locally produced forest products available to meet New Englander's own needs, as well as for export, improve the local and regional economies and provide the greatest social and environmental benefits?

The purpose of this project is to document that potential by analyzing what we know about how improved silviculture can enhance wildlife habitat, the quantity and quality of timber, recreational opportunities, and the environment. The best available data from the US Forest Service, state forestry agencies and universities was used to characterize this potential.

The technical reports produced for this project document the potential for:

- Mitigating climate change;
- Increasing timber production to support a more robust forest products industry;
- Restoring important wildlife habitat;
- Replacing fossil fuels with wood to produce thermal energy;
- Reducing greenhouse gas emissions, not only by substituting wood for other fuels, but also wood for other construction materials;
- Enhancing forest recreation opportunities and related tourism;

- Expanding production of nontimber forest products;
- Maintaining other forest values such as their role in providing clean air and potable water – taken for granted but not guaranteed;
- Enhancing the region’s economy by meeting more of our own needs with New England products and retaining more of the region’s wealth within the New England economy; and
- Other related topics.

These technical reports are viewed as “works in progress” because we invite each reader to bring their own contributions to this long term effort of protecting, managing and enhancing New England’s forests. The entire set may be viewed at www.newenglandforestry.org. If you have suggested improvements please contact the New England Forestry Foundation to share your thoughts. These technical reports were used as the background to prepare a summary – *New England Forests: The Path to Sustainability*, which was released on June 5, 2014.

If you are not familiar with NEFF's work please visit www.newenglandforestry.org. Not already a member? Please consider joining NEFF – <https://41820.thankyou4caring.org>.

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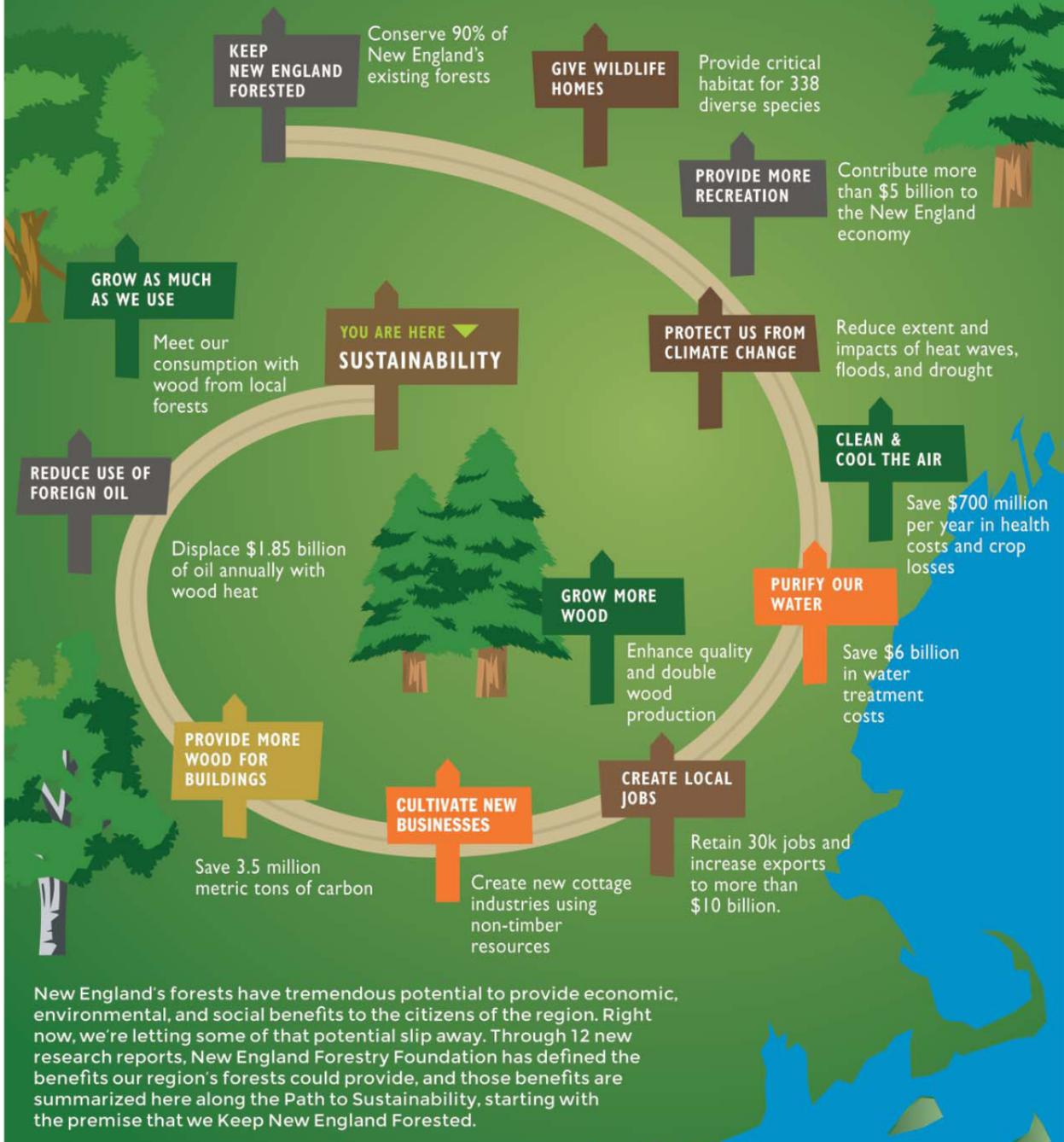
The New England Forestry Foundation is a recognized leader in conserving working forests, educating the public about forestry, and assisting landowners in the long-term protection and stewardship of their properties. For almost 70 years, we have demonstrated that well-managed working forests can provide landowners and the community with the prime ingredients for healthy living: clean air and water, sustainable production of an array of forest products, healthy forests for hiking and relaxation, a diversity of wildlife and habitats, periodic income, and renewable natural resources that help support rural economies.

Our Mission is to conserve New England’s working forests through conservation and ecologically sound management of privately owned forestlands in New England, throughout the Americas and beyond.

This mission encompasses:

- Educating landowners, foresters, forest products industries, and the general public about the benefits of forest stewardship and multi-generational forestland planning.
- Permanently protecting forests through gifts and acquisitions of land for the benefit of future generations.
- Actively managing Foundation lands as demonstration and educational forests.
- Conservation, through sustainable yield forestry, of a working landscape that supports economic welfare and quality of life.
- Supporting the development and implementation of forest policy and forest practices that encourage and sustain private ownership.

THE PATH TO SUSTAINABILITY



NEW ENGLAND FORESTRY FOUNDATION

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CREATE LOCAL JOBS: Vision for New England's Wood-Based Industries in 2060

**Prepared by Innovative Natural Resource Solutions, LLC
and The Irland Group**

Part of a larger project on the potential of New England's forest lands coordinated by R. Alec Giffen for the New England Forestry Foundation. Component parts include the following of the larger effort:

1. **KEEP NEW ENGLAND FORESTED:** Assessing the Current Conservation Status of New England's Forests by Jerry A Bley
2. **GIVE WILDLIFE HOMES:** Potential of New England's Working Forests as Wildlife Habitat by Jerry A. Bley
3. **PROVIDE MORE RECREATION:** Forest Recreation Trends and Opportunities in New England: Implications for Recreationists, Outdoor Recreation Businesses, Forest Land Owners and Policy Makers by Craig Ten Broeck and Aaron Paul
4. **PROTECT US FROM CLIMATE CHANGE** by R. Alec Giffen and Frank Lowenstein
5. **CLEAN AND COOL THE AIR:** Forest Influence on Air Quality in New England: Present and Potential Value by Aaron Paul
6. **PURIFY OUR WATER:** The Potential for Clean Water from New England Forests by Aaron Paul
7. **GROW MORE WOOD:** The Potential of New England's Working Forests to Produce Wood by R. Alec Giffen, Craig Ten Broeck and Lloyd Irland
8. **CREATE LOCAL JOBS:** Vision for New England's Wood-Based Industries in 2060 by Innovative Natural Resource Solutions, LLC and The Irland Group
9. **CULTIVATE NEW BUSINESSES:** New England's Nontimber Forest Products: Practices and Prospects by Craig Ten Broeck
10. **PROVIDE MORE WOOD FOR BUILDINGS:** The Greenhouse Gas Benefits of Substituting Wood for Other Construction Materials in New England by Ann Gosline
11. **REDUCE USE OF FOREIGN OIL:** The Potential for Wood to Displace Fossil Fuels in New England by Innovative Natural Resource Solutions, LLC
12. **GROW AS MUCH AS WE USE:** Production versus Consumption of Wood Products in New England by Craig Ten Broeck

A. Why Illuminate the Potential of New England's Working Forest Lands

New England is defined by its forests. The region is blessed with abundant forests, the vast majority of which are privately owned. The region has a long and proud tradition of forest management, and is blessed with a wide range of species, many of which readily regenerate naturally. These forests provide a wide range of goods and services to society – from lumber and pulp for the region's mills to wildlife habitat to recreation. The forests are a source of clean water and air, and store carbon. Beyond tangible benefits that can be measured in terms of board feet or miles of trails, forests have been shown to be important to both physical and mental health.

The forests of New England have supported a diverse and changing forest industry. From sawmills making lumber to wood chips heating schools, an interconnected and dynamic forest industry extends from the forests through the mill to the consumer. The diversity of tree species, coupled with a long tradition of forest products manufacturing has provided public and private landowners access to a wide range of markets. These markets in turn provide revenue to support forest management activities; jobs throughout the region in forest management, harvesting and manufacturing; and offer the marketplace sustainable products for a range of uses.

B. Summary of the Conclusion

New England's forest products industry is a significant part of the region's economic base, particularly in rural areas, contributing annually approximately \$4 billion and over 30,000 jobs to the region's economy. Looking to the future, the forest products industry in the region has significant competitive advantages, but also faces significant challenges.

The challenges before New England's forest products industry include:

- Relatively high manufacturing costs when compared to other regions nationally or globally;
- Globalization of forest manufacturing, and associated imports of value-added products once sourced locally;
- A perception (sometimes warranted) that the region has a challenging regulatory environment;
- A population that is disconnected socially from forest management and wood products manufacturing, thus valuing forests for reasons other than the production of tangible goods; and
- Small forestland ownerships in southern and parts of central New England, which make the management of forestland economically challenging.

These challenges, while real, are countered by enormous opportunities, including:

- Proximity to one of the largest and wealthiest markets in the world, running along the Eastern Seaboard from Boston through Washington, DC, as well as major metro areas from Toronto to Quebec City;
- An opportunity to increase interest in purchasing locally manufactured goods, much as interest in locally-produced food has seen an increase;

- A forest industry “cluster” that has developed a complex and dynamic network of manufacturing opportunities, supported by world-class research and development capacity at a number of institutions;
- Strong and growing landowner and industry organizations, which support peer-to-peer information sharing; and
- A skilled labor force both in the woods and in the mills.

New England has the opportunity to address these challenges and capitalize on these and other opportunities to support a robust and diverse forest industry. Achieving such a lofty goal will not be easy, but the region already has a strong base upon which to build.

Given the history of the forest industry and current trends, it is easy to envision a future of decline. New England’s forest products industry could, as a whole, follow the decline experienced in southern New England

It is also possible to envision a future in which the forest products industry is more diverse and productive and continues to support local communities. It would involve:

- Support for the industry and forest management from conservation organizations and the public;
- Keeping forests as forests and maintaining a large proportion of them as working forest lands;
- Increasing the productivity of New England’s forests – not just in terms of volume of material produced, but more importantly the quality of that timber;
- Cultivating entrepreneurial talent and behavior and developing a stronger creative forest products industry cluster within the region;
- Focused training for workers;
- Retaining, to the maximum extent possible, large manufacturers;
- Strengthening and diversifying the forest products industry in southern New England;
- Engaging small landowners throughout the region in active forest management including sustainable timber harvesting; and
- Developing a reputation for leadership on sustainability. Sustainability in forest management, as well as sustainability in manufacturing.

Achieving such a future will not happen by itself – rather it will require focus, determination and creativity. A key part of the effort to achieve this future will be reaching broad agreement among key actors within the forest products industry, forest owners’ community and conservation organizations on a vision for the future that includes both forest management and forest manufacturing that is publically supported. This will require a heightened sensitivity to public perceptions of forest management and an unprecedented level of collaboration among these interests.

The region’s forest products industry has a long history of surviving – and then building upon – challenging times. While New England has seen the loss of mills and markets in the past decade, those

that remain are often stronger and more nimble. It is these “survivors” that will form the core of tomorrow’s industry. While certainly facing challenges, the region’s forest industry has the potential to grow significantly, and may represent between \$10 billion and \$30 billion in shipments by 2060.¹

C. Historical Context and Perspectives on the Future

This paper develops some ideas about a potential forest-based manufacturing industry and energy sector in New England. It is based on extensive consulting experience in several sectors of this industry, extensive travel and study, and on our combined professional judgment. Further, the authors are familiar with forest and industry conditions in important competing regions of North America and the World. It offers some compact and selective summaries of the history and broad scenarios for the future. For such a long time period as 50 years, numerical predictions are not very useful. Still, we refer to predictions by others that are widely used.

The headline result of this review is that if nothing is done to respond to likely future trends in working forest area, wood availability, entry of entrepreneurs and financing, worker skills, and marketing programs, the region faces a future of declining employment opportunities in its rural communities, increasing difficulty in competing for all wood product businesses, and greater difficulties in securing improved forest management as wood markets dwindle. On the other hand, well-crafted policies to address these issues have potential to improve this situation significantly. Specifying those policies is not within the scope of this paper.

1. Fifty Years and Macro Stories

What might 50 years mean? To convey a sense of how much can change in 50 years, let’s look back for a moment.

50 years ago, Ponderosa Pine, Southern Pine, and Douglas Fir dominated the region’s lumber markets, much of this brought by water. The front end loader, the pallet, and the shipping container had only recently been invented. In 1960, Maine’s lumber production was mostly in southern Maine. River driving was still common to get logs to the mill. The last vestiges of labor intensive traditional New England industries (wood and otherwise) persisted.

The photo on the cover of this report was chosen advisedly. A modern high production sawmill is a heavily computerized package of machinery. Its high technology devices are running basically low tech machines, to produce a 2x4 – about the lowest-tech product you can imagine. None of the computer gear and software now essential to an efficient and profitable modern sawmill existed—even on the drawing boards—in 1960. Or even in 1980.

Fifty years ago the ski industry was small and still used T-bars extensively at major ski areas; four-lane highways into the North were absent. Snowmobiles as a mainstay of winter recreation and tourism were in the future. The white water rafting industry did not exist.

Farming has changed since 1960 so as to be barely recognizable today, and farms continued to release land to urban, recreational and forest uses until very recently.

¹ See Attachment A

Widening our view, even more dramatic changes occurred:

The Berlin Wall did not exist in 1960 - it has come and gone;

Soviet Union, then an arch enemy in the Cold War, has collapsed. China has opened up, and changed global manufacturing (note: without the benefit of any noticeable domestic timber resource);

In 1960, the cargo container and the container ship barely existed. Already, superships carrying thousands of containers are on the world's waters – the newly widened Panama Canal will bring them much closer to New England; and

China has emerged onto the world stage – the world's largest container port is now Shanghai.

These changes were unpredictable. Even ones considered likely at the time could not be predicted as to timing or all of their effects. Over the coming 50 years, change could be even more dramatic, given the increasing rate of change in technology and markets. This argues for a certain humility in making forecasts for a future half century.

Our purpose in this paper is to probe possibilities in the very long term – not to generate a single numerical forecast for decision-making and, then to try to understand their implications for New England.

2. What Does Fifty Years Mean for a Forest?

Thirty years is a traditional analysis period for pulp mill feasibility studies. There is clear recognition that the forests can, should and will be productive beyond this horizon, but mills often find this period – 120 quarters – to be longer than they can accurately predict markets, costs and other key variables.

Fifty years is easily three cutting cycles (times between partial cuts) in a managed woodlot, and more than one full rotation for most industrial plantations. It is entirely possible – likely if current trends continue – that all the industrial plantations now on Investor lands will have been harvested in fifty years! They are not likely to be replaced.

Change in the next 50 years will not be monotonic or continuous – it can happen in brief periods. More land ownership change in northern New England occurred during 1990-2010 than in the previous half century. The post 1990 slide in paper took place rapidly. The lumber washout after 2005 when 50% of US lumber production disappeared in just a few years is an extreme example. Energy crises and booms in biomass plants and interest in wood based biofuels, followed by decreased interest when the global and local energy situation changed - are other examples of boom-bust episodes. Periodic housing booms/recessions will recur.

3. Some Time Slices into the Future

To help us see the dynamics, we can think of several time slices into the future. We do not build our analysis on these, but show them to recognize that change will not be uniform over the period; underlying drivers are likely to change, often in rapid and disruptive ways. The longer we peer into the future, the wider the range of possibilities.

Table 1. Some time slices of the coming half century

Time period	Major points	Events/implications for New England
Near Term 2-4 years	Post Crisis “Recovery” is spent Panama Canal will be widened Housing could reach another peak	Import challenges could increase Natural gas enables paper mills to survive
10-15 years	Euro economy recovers US economy can no longer ignore its debt/deficit issues China likely to exceed US GDP China fiber deficit is huge	Worst of shrinkage in US paper may be over Urban and suburban sprawl continues Gas bubble dwindles?
16-50 years	Virtually complete exhaustion of traditional tropical hardwoods; rapid replacement by plantation grown species. US softwood lumber production may not exceed 2005. Will a second growth fiber economy emerge in Russia? Late in period –climate change footprint becomes visible in vegetation?	Economic growth in BRICs (Brazil, Russia, India, China) absorbs own production, import pressure on the US forest sector may ease. New England will need local wood again.

D. Why Do We Care About Wood Based Manufacturing?

Wood based manufacturing is a part of the Northeast’s history. While it is now a small portion of the region’s GDP, it remains an important source of livelihood in rural areas. This is as true in Aroostook County, Maine as it is in eastern Connecticut.

More specifically, there are a number of practical reasons why locally based wood products employment is important:

1. The region’s manufacturing sector, while it has shrunk severely, remains important to the overall economy. Shrinkage in other forms of light manufacturing has left many communities struggling to see a future for their children. As productivity increases, there are fewer manufacturing positions available, but these positions are often highly skilled and pay wages and benefits well above other opportunities available in rural New England.

2. Even small plants are important to the tax bases and local employment in rural communities. For example, a 1995 survey conducted of Maine forest industries indicated that individual mills were one of the largest employers and taxpayers in their host communities in 71% of responses.
3. Every time an ice storm or other disaster occurs, it is valuable to have equipment, crews, and markets capable of handling the downed trees that bring down power lines, block roads, and damage buildings. Hurricanes, tornadoes, and super storms of recent years have demonstrated this.
4. Finally, and importantly for the future of the forest, improved forest management practices hinge on markets for wood. These markets need to be diverse and competitive. The effects of absent pulpwood or other low-grade markets in southern New England are there for all to see – forests are accumulating more and more poor quality wood. The cost of trucking wood is an important factor in determining how well landowners can get paid – having a diverse array of small local markets is the best way to overcome this.

Additionally, we are a region and nation of consumers. New Englanders use wood for framing houses, printing magazines, making furniture and heating our homes. As argued in the 2002 paper *The Illusion of Preservation*, the use of forest resources from well-managed local woodlots is often the most environmentally responsible sourcing, and also provides significant contributions to the local economy.

Using low-grade wood for energy – either for thermal applications or electricity generation – allows landowners, foresters and loggers a market for their low-grade and low-value wood. This provides the opportunity for forest managers to economically remove less commercially-desirable trees, concentrating future growth on higher valued stems. Additionally, wood energy is local energy; wood is the region’s native energy source, and if used wisely and efficiently can help retain wealth in the regional economy while supporting local forest markets.

What follows is a discussion of some of the currents and counter-currents that impact the region’s forest industry. It is important to note that the industry – and the forests that support it – are complex and dynamic. There is no one unifying perspective or trend, instead there are a great number of forces reacting to one another, and it is this interaction that holds both promise and challenge for the forest industry.

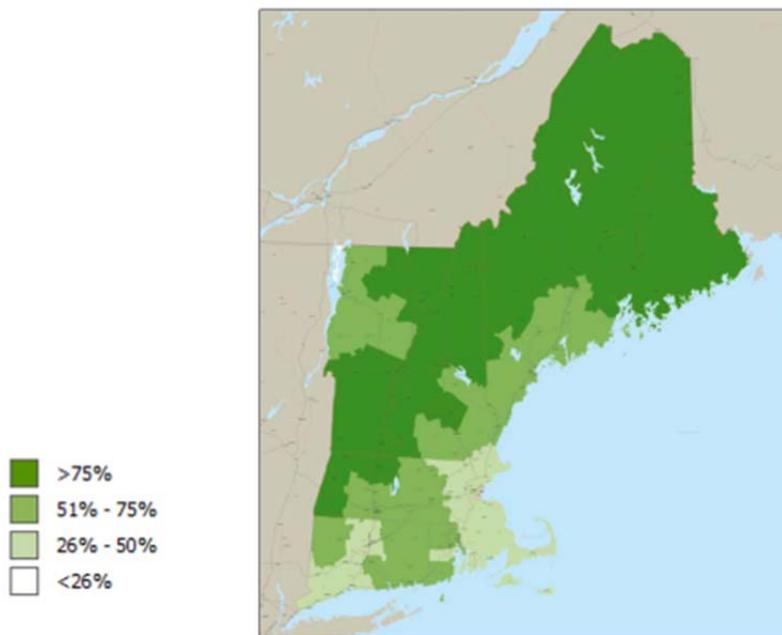
E. Geography

Bearing in mind the above sense of what can change in 50 years, we can see several distinct sub-regions within New England that will likely fare differently. The forest’s future will not be one uniform story. We do not plan to disaggregate data by these regions but rather to speak generally of how they differ.

- Urban and inner suburbs
 - As shown in Figures 1 and 2, the regions of New England with the highest population density are less forested. This is not a surprise, as development displaces forests. While often thought of as disconnected from the forests and forest industry, urban and inner suburban areas – such as those around Boston, Hartford, New Haven, Providence and New York City -- often contain a meaningful amount of forest-based value-added manufacturing. Also, urban areas contain and can potentially supply a surprising amount of wood for forest products and energy.

- Big woods
 - Northern and Western Maine, along with Coos County in New Hampshire and Vermont's Northeast kingdom have long been known as regions where forest industry is dominant, and forestland is working forestland. Land in this region was traditionally owned by forest products manufacturers, such a pulp and paper mills. The harvests from these lands served as raw material for the local mills. In the past two decades, this changed dramatically – there are no major industrial landowners in New England today². Instead, this land is owned by investor groups, coupled with conservation organization and family forestland owners (Irland, Hagan and Lutz 2011).
- Rural, forested woodlands
 - Much of New England – southern and coastal Maine, southern New Hampshire, western Massachusetts and rural Connecticut – is forested and has a population density greater than 100 people per square mile. In these regions, family forest owners control the vast majority of forestland, often in small, fragmented parcels. Encouraging long-term management of this forestland has been a long-term challenge for the region's forestry community.

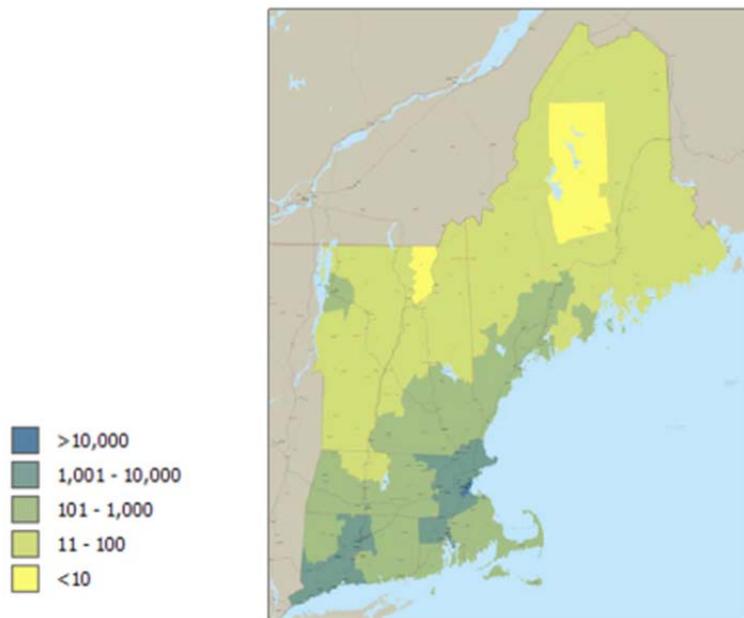
Figure 1. Percentage of forested land by county



Data sources: Acres of forestland from US Forest Service – Forest Inventory and Analysis, years 2008 – 2012; Total land area from US Census Bureau.

² JD Irving Ltd, of New Brunswick currently has no manufacturing in Maine, but has announced a new mill at Ashland Maine.

Figure 2. Population Density (people / square mile) by County



Data sources: Population data from US Census Bureau, 2010 census; Total land area from US Census Bureau.

As discussed above, New England forests produce a variety of species and grades. These, in turn, can be used to create a wide range of products. The following discussion addresses a range of major and emerging forest industries, and discusses where these markets have been and where they may be going.

F. Solid Wood Products – Strategic Assessment

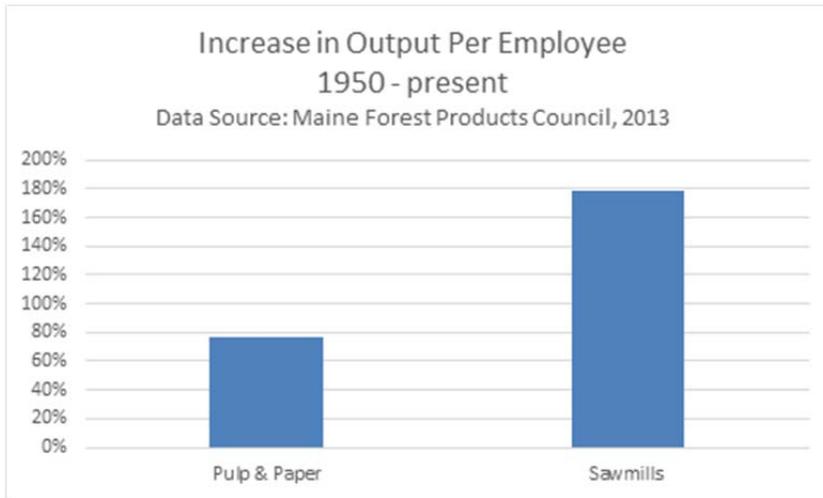
Principal uses of region's woods include

1. Structural lumber (spruce-fir),
2. Rough timbers, posts, etc.
3. Millwork and related products,
4. Hardwoods for appearance uses, and
5. Low grade uses such as dunnage, crating, pallets
6. Panels, structural or appearance applications
7. Secondary products -- highly diverse and widespread
8. Emerging and novel products

All of these products are important to the industry – and all are important to landowners.

Survival for most of these producers will rely on continued reductions in labor input via mechanization and lean manufacturing. Over the coming 50 years, this will be an important influence on employment levels, as it has been over the last 50. On the other hand, higher skilled and more productive jobs will mean that the contribution to payrolls and value added need not decrease.

Figure 3. Increase in output per employee, 1950 - present³



Key innovations in this sector often hinge on innovations in other sectors -- the steel connector companies invented the wood truss; the adhesive companies were key in panels; WWII and the front end loader (50s and 60s) for pallets. Shipping companies invented the container and the 1,200 box vessel. Electronics now essential in mills & logistics comes from outside the wood products sector. In the diversified value added sectors, small firms in clothespins and all the rest often built their own or adapted machinery. Such skills have now largely vanished. China is coming close to owning the wood processing machinery market.

Technology and investment traps – US hardwood plywood end users have technology built around a 1/42 “ sheet – Europeans routinely slice veneer to 1/100” (!). This is why the best veneer logs leave the country and will continue to do so. From the standpoint of forest management, though, the opportunity to obtain the best possible prices for the forest’s products should be welcomed.

What the USFS is seeing for the national market--

RPA Baseline (GTR FPL 219, p. 9 & 10) shows US apparent consumption of sawnwood taking about 30 - 40 years to return to the 2005 peak from its depressed 2010 level.

For wood panels and veneer products, they show a much stronger outlook – with apparent consumption about 30% above the 2006 peak by 2060.

They expect us to see a period of net exports of sawnwood products from 2015 to 2040, and to become a modest net exporter of panels and veneer after about 2020.

³ Data from Maine Forest Products Council, “Maine’s Forest Economy”, November 2013, maineforest.org/wp-content/uploads/2013/11/Maines-forest-economy-for-web-11-26-2013.pdf

Table 2. Summaries of key factors on solid wood in the next 50 years

Product and issue	Remarks
Structural framing lumber	Framing lumber includes 2X4s, 2X6s, and studs of various lengths for structural framing, usually in residential and other light construction.
Species	Spruce and fir, some hemlock
Demand outlook	Framing lumber depends heavily on new residential construction and repair and remodeling. Metal substitutes have taken share in urban and commercial construction, but in limited instances, advances in multistory wood construction are reported. Near term outlook appears to lean heavily toward multiunit housing; recovery to the very large home sizes typical of 2004-2006 may take some time. Widespread use of I-joists has boosted demands for 2X3 but at the expense of the 10” and 12” widths.
Current import penetration	Roughly 30%, mostly from Canada. Limited imports of higher quality material from Europe are likely to recover to mid 00’s levels. The early 00s peak was roughly 3 times Maine production at that time.
Future import sensitivity	Low to moderate – the current beetle-induced cutting levels in British Columbia will decline. Situation could depend on level of the Canadian dollar, which is impossible to predict over a 50 year time horizon.
Dependence on local timber	High. This product class is now concentrated in a small number of high-tech mills that are located on the edge of the spruce fir belt; they will purchase from middle portions of New England where the species occur. Likelihood of additional mills being built in this product class is extremely low, due to their capital intensity and size, and the near term supply situation ⁴ . Spruce-fir inventories in this region are expected to recover – as they do the existing mills will likely absorb the additional wood.

⁴ Prior to this report being drafted, Irving Forest Products announced a new mill in Ashland, Maine. Irving has an existing mill site, existing distribution channels, and own significant timberland with which to supply their facility. Nobody else is expected to enjoy such a combination of benefits for establishing a new dimension mill.

Product and question	Remarks
Rough timbers, posts, etc.	A variety of products, minimally processed, often used green, used in local rough construction, such as outbuildings in areas with no building codes, or low cost structures for storage. Also specialties such as landscape ties, wooden travel mats for construction sites, and others. Often sawn in small local mills, sometimes operated seasonally.
Species used	Various; many, though not all, of these products can use lower grades of logs than sawmills commonly seek to purchase.
Demand outlook	Should improve materially as the economy improves and the costs of shipping these in from elsewhere increase.
Current import penetration	Low, due to the low value of the products, and the fact that much distribution is direct to end users. Exceptions have occurred for bulk items in the past: at one time, aspen landscape ties came in from Canada.
Future import sensitivity	Low
Dependence on local timber	High, due to limited shipping distances and relatively undemanding log specifications used.



Product and question	Remarks
Millwork and related	Windows, doors, mouldings and closely related items. Generally the industry is not vertically integrated, buying lumber through wholesalers. Exceptions are primarily the large white pine mills.
Species used	White pine and selected hardwoods. Generally, straight-grained, high quality wood free of cross grain and knots is required. Only a small percentage of the lumber will meet these specifications. Many plants in the region bring in wood from elsewhere.
Demand outlook	Moderate. See housing outlook. The shift in interior millwork fashion to paint grade has hurt, as paint grade needs are well served by MDF moldings with overlays. Composite doors are functional and low in cost, and are replacing traditional built-up solid wood doors. Plastic lumber has entered markets for exterior trim in force due to its workability and durability in applications (soffits) subject to decay.
Current import penetration	Varies by product; very high in mouldings, low in other product groups. Radiata from New Zealand and Chile will be available in larger quantities, though much will go to China as logs before coming here as end products. Radiata has seen some mis-utilization in the US market and may be up for a re-appraisal by end users, but its previous price discount to white pine has disappeared.
Future import sensitivity	High to moderate.
Dependence on local timber	Low – the industry is accustomed to purchasing from a wide range of sources

Product and question	Remarks
Appearance hardwoods	Higher grade hardwood lumber, plywood, and veneers for uses such as furniture, cabinets, doors, flooring and other higher value uses. The US exports considerable hardwood lumber and also veneer logs. This is likely to continue; growth is uncertain.
Species used	Primarily oaks, maples, birches.
Demand outlook	Moderate. Demand depends on housing construction and incomes. At the same time, there is likely pent-up demand for remodeling and replacements. As well, many families are upgrading their current homes instead of buying new. Competing raw materials (e.g. bamboo flooring) have made serious inroads. Much final preparation and installation in these markets is local – and many of the firms/jobs in this field are in urban areas. Many of these firms do not know where their raw material comes from. Their customers rarely ask.
Current import penetration	Varies by product line. China now supplies about 1/3 of the nation’s wood furniture; in molding and millwork items, import share is much higher. In flooring and cabinets, offshore species similar to US species, or with similar names (e.g. jatoba-Brazilian cherry) are very strong especially at low price points.
Future import sensitivity	For the coming 10-20 years it will be high. Beyond that, as labor costs rise in China and other low wage nations, and their own market absorb production, US import sensitivity may decline. So far, cabinets have resisted high import penetration, but many domestically produced cabinets now have imported components.
Dependence on local timber	Low.

Product and question	Remarks
Utility products using low grade wood	<p>The classic case is the pallet. Some pallet plants saw their own wood, others buy in low grade lumber. Producers of crating, dunnage, and other utility items are important to the lumber industry as they provided markets for 30-40% of the lumber sawn that cannot be sold at prices that even recover log cost. Pallets alone at one time used roughly a quarter of all US hardwood lumber production.</p> <p>In the past, much of this business was integrated with sawmills, who used their low grade production internally.</p> <p>Not devoid of innovation: the emerging field of anti-erosion mats has been growing recently.</p> <p>Competitiveness depends on high conversion efficiency, controlling labor cost, and good marketing.</p>
Species used	Numerous
Demand outlook	Depends on the product. For pallets, the shrinkage of all forms of manufacturing in the Northeast reduced demand for pallets and other forms of wood used in shipping products.
Current import penetration	Low for many, except pallets. The case of pallets is instructive – imports of consumer goods from China and elsewhere arrive on pallets produced there which thus supplant local production.
Future import sensitivity	Surprises are possible. At one time, pallet parts from Brazil were being sold in the Northeast.
Dependence on local timber	Varies.

Product and question	Remarks
Wood panel products	Plywood and veneers. Very little produced in the Northeast. Volume requirements are high. The few veneer plants buy wood over a very wide region.
Species used	<p>Principally the high value hardwoods. Some lower value woods used for corestock. No softwood plywood is produced in the region. OSB plants in northern Maine rely heavily on aspen and produce specialty panels.</p> <p>The principal outlet for the very best quality veneer logs is exports. This is because European veneer plants can peel or slice to extremely small thicknesses, while the US industry remains confined to the 1/42” thicknesses, due to the sanding equipment used by all of its customers. This is unlikely to change, especially as the domestic furniture and cabinet industries continue to be under siege by imports.</p>
Demand outlook	Demand will slowly rise for these products. Due to economies of scale, it is unlikely that more large-scale panel mills will ever be built in this region.
Current import penetration	Moderate to high. In OSB the competition is from Canada and large mills elsewhere in US. The region brings in all its softwood plywood from other US regions.
Future import sensitivity	High
Dependence on local timber	Low, except for established producers.

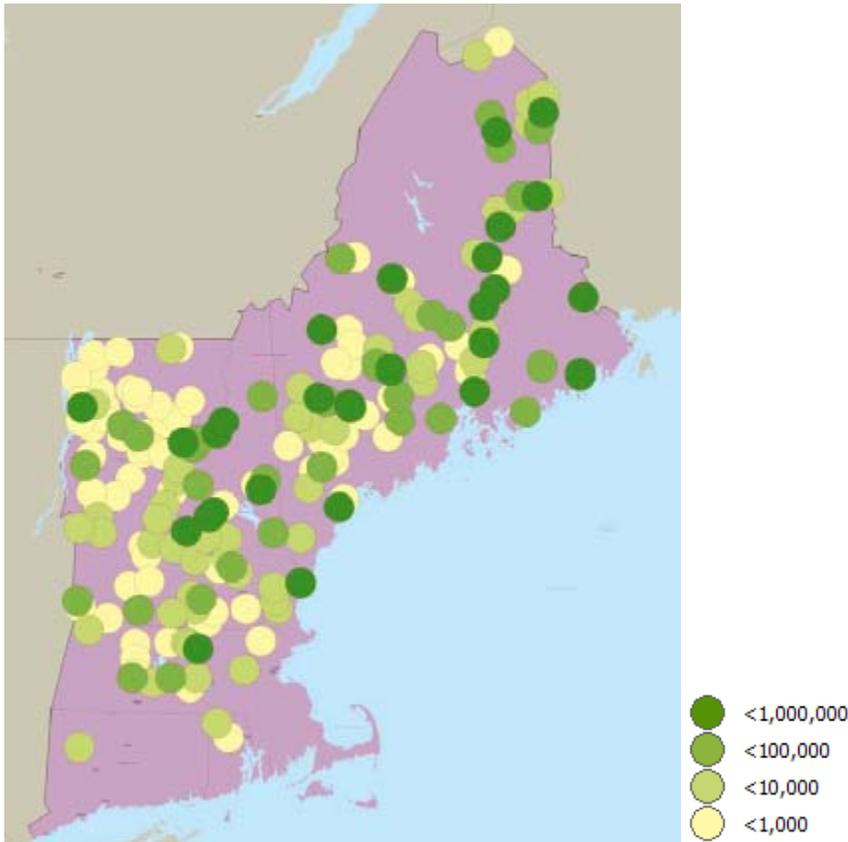
Product and question	Remarks
Secondary products, Including furniture	The region is not competitive in volume furniture production, but contains numerous small specialty shops, and a few well known high end producers such as Thomas Moser (which uses Pennsylvania hardwoods) and Pompanoosuc Mills. Traditional turnery and other secondary products are labor intensive, have high wood quality needs, or have been supplanted by plastics and other substitutes. Some familiar products, such as cedar lawn and garden items, are labor intensive, rely on a resource only locally available, and have declined in usage.
Species used	Many.
Demand outlook	Moderate, but many small firms with niche markets are succeeding and will continue to do so. They will need to adjust to market trends. As quality demands rise, these firms will be more capital intensive and will need higher skilled labor and will operate at a larger scale. The shift to RTA (ready to assemble) furniture turned out to benefit import suppliers more than domestic ones. The technology for applying laminates and edge banding to Medium Density fiberboard helped to keep costs down but freed the industry from timber-dependence, as MDF is shipped long distances.
Current import penetration	Some categories, such as dowels, are now dominated by imports; for some specialties, “re-shoring” is occurring.
Future import sensitivity	As a broad generalization, import sensitivity will continue to be high.
Dependence on local timber	Low to moderate.

Product an question	Remarks
Emerging and novel products	Example: densified wood; FRP glulam beams; cross-laminated timber; hardwood beams; nanotechnology. In the past, new technologies have revolutionized major sectors of the wood industry. Examples included glulam beams, particleboard and Medium Density Fiberboard, formica and other overlays, CNC routers, and the wood composite I-joist. All too often, these technologies have succeeded at the expense of existing wood products instead of competing raw materials. Also, some of these technologies will turn out to have their most competitive locations in other regions or countries, (e.g. bamboo flooring). Finally, the innovations generating these new product classes often emerge from supplier industries and not the wood sector itself. An example is the development of the engineered truss, fostered by the producers of truss connectors.
Species used	Various. In the past, technologists have tried to focus on underutilized species but market demands rarely specify these.
Demand outlook	Uncertain – it’s the nature of these things. Depends on comparative price and policy.
Current import penetration	Low
Future import sensitivity	Unknown
Dependence on local timber	Will depend on product and process. Many of these technologies can use low grades of wood but require very large quantities due to their capital intensive production technology. In such cases, locations in New England may not be competitive.

G. Biomass Industry

Using wood for energy has a long history in New England. The region has been a leader in the development of biomass electric facilities. It is also home to one of the first wood pellet manufacturing plants in the US, and today explores new uses of wood for energy as liquid fuels or for export as a refined fuel.

Figure 4. Utility and community scale biomass installations (fuel use per year, green tons)



In addition to cordwood use in home heating applications, New England forest industries have long used biomass as process heat and to produce electricity. Industries often used their self-generated residue – such as bark or sawdust – as the fuel source. Today, a number of mills, including most paper mills in the region use biomass to generate some or all of their energy.

In the 1980s, public policy encouraged the development of stand-alone biomass electric facilities. Biomass plants, ranging in size from around 10 megawatts to 50 megawatts, were constructed in Maine, New Hampshire, Massachusetts and Vermont. Most of these plants continue to operate today.

Around 2003, another wave of biomass development began in New England, with states adopting incentives or mandates for utilities to purchase renewable power. Biomass was well positioned to capitalize on this market, and a number of facilities made investments or otherwise qualified to participate in these “Renewable Energy Certificate” (REC) markets. A number of facilities in Northern New England were able to generate revenue from both selling electricity and selling RECs, often to utilities in Massachusetts and Connecticut. This set up a dynamic where ratepayers in one region of New England were financially supporting biomass plants in another region.

Today biomass electric facilities continue to operate, a new facility has recently come on-line in New Hampshire, and facilities are proposed in Vermont and Connecticut. However, the electricity market has changed since only a few years ago; an abundance of natural gas in this country has dropped wholesale electricity prices. Many facilities are facing challenges to continue operating, and the economic viability

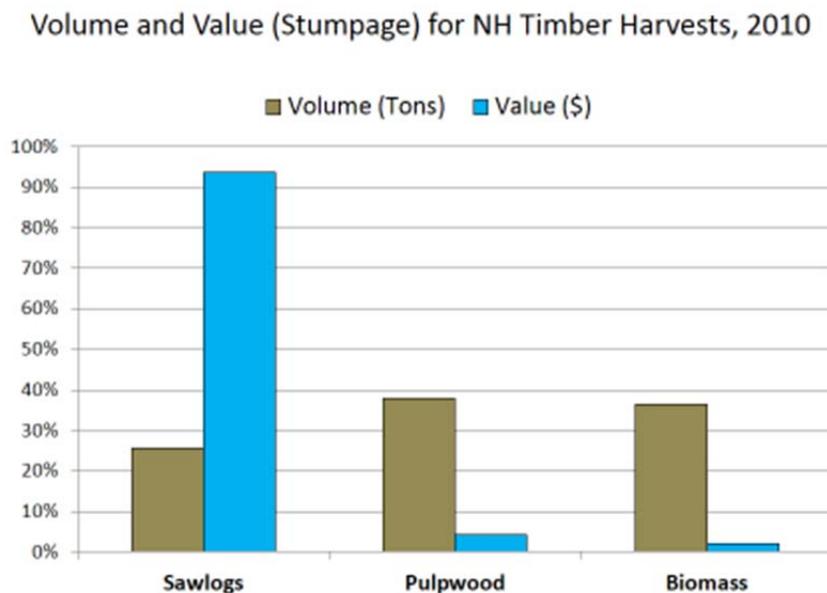
of a facility often depends on unit-specific fuel supply and electricity sales dynamics. In the short-term, infrastructure restrictions on moving natural gas into the region provide biomass electric with some opportunities. This lack of infrastructure will be addressed in time, and biomass electric will then face extremely challenging economic conditions.

While biomass electric has struggled, biomass thermal applications have grown. In addition to the familiar cord wood stoves in so many New England homes, pellet stoves, chip boilers for community scale biomass facilities, whole-home pellet boilers and a range of other devices exist to provide biomass heating options for every customer.

Unlike biomass electric, biomass thermal often competes well against other fuels – this is particularly true when compared to oil, a dominant heating fuel in New England. Biomass thermal has grown significantly in recent years as technology, economics and consumer awareness have provided opportunities to provide everything from space heat from a pellet stove to large central boilers. As biomass thermal continues to grow, challenges include a supply chain that is not yet easily accessible to consumers, and high capital costs associated with the purchase of a new heating appliance and fuel delivery and storage.

While biomass markets offer an opportunity to sell low-grade wood, and to conduct forest thinning operations, these markets are not economically attractive as a sole source of income for a landowner. New Hampshire, for example, is a New England state with diverse forest types and markets, including a number of operating biomass electric facilities and pulp mill markets in nearby Maine and New York. In 2010, biomass accounted for 36% of the volume harvested, but represented only 2% of the stumpage value paid to landowners. By contrast, sawlogs (used for lumber production) represented 26% of the volume harvested and 94% of the stumpage value paid to landowners (Figure 5).

Figure 5. Volume and value by product type, New Hampshire 2010

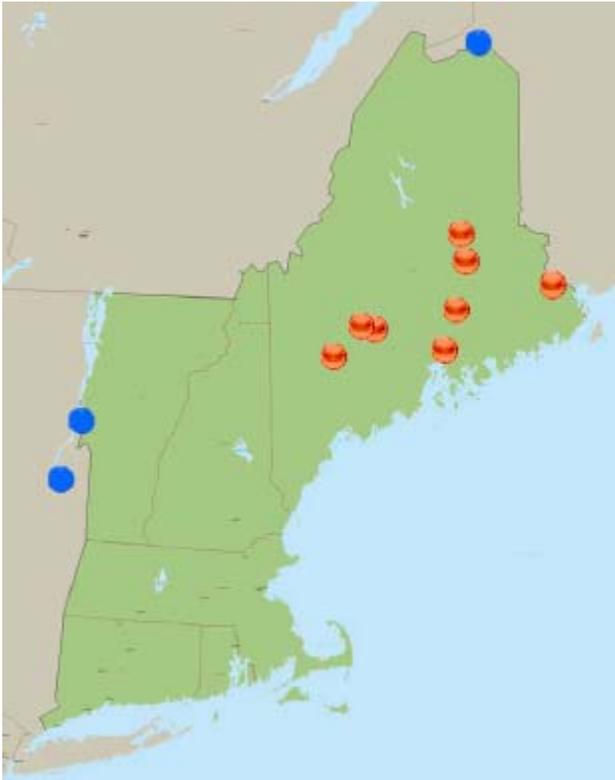




H. Paper Manufacturing

Pulp and paper manufacturing is a capital intensive and highly competitive industry. Fifty years ago pulp and paper mills could be found in a number of New England states. Today, Maine is the only New England state with mills that buy wood and produce pulp and paper (note – paper mills exist in every New England state, but these often rely upon imported or recycled fiber, and do not necessarily provide markets for local forest landowners).

Figure 6. Pulp mills in New England and proximate regions



The last decade or two has seen a marked change in ownership of the region’s pulp and paper mills. Once dominated by traditional publicly traded forest products firms that had integrated operations (often including woodlands and sawmills), today many pulp and paper mills are owned by private equity firms. While these new owners often bring economic discipline to operations – and it is possible some mills would close without such discipline – it is not clear that the level of investment in efficiency and new product development is being undertaken to assure future opportunities for the mills.

The last pulp and paper mill built in New England was SAPPI’s mill in Skowhegan, Maine, completed in 1982. It is inconceivable that a new paper mill would be built in New England today and hard to imagine one in the next fifty years. The region has long produced communication paper – used in writing and publishing – and that market is under threat from a number of sources. For decades, New England mills have been competing against production from other regions of North America and from offshore. That competition is not going away and may intensify. More recently, and more fundamentally, communication paper consumption has dropped often supplanted by electronic forms of communication such as email and reading books on tablet computers. Finally, the size and wood requirements of a world-class pulp line today are so large that mobilizing enough wood for one would be difficult and costly.

The one bright spot regionally is tissue. Because this bulky product is expensive to ship, tissue often competes well in regional markets, and is somewhat insulated from competition from offshore or out-of-region mills. A few mills have installed tissue lines and more are considering doing so. This is certainly

a market that cannot be replaced by an electronic alternative, but it is also limited and may be approaching regional saturation.



White pine in private, managed forest in western Maine. Chadbourne lands.

Table 3. Summary strategic checklist for product categories

Industry	Species	Demand outlook	Import sensitivity	Dependence on local timber
Structural Framing Lumber	Spruce fir, hemlock	modest	Low – but of Canada	High
Rough timbers, posts, etc.	Hemlock, some hardwoods	modest	None	High
Millwork and related	Pine, oaks, etc.	mild	High	Low
Appearance hardwoods	Oaks, maple, cherry, etc.	mild	High	Moderate
Low grade utility products	Many	modest	Low	High
Panels	HW: premium species; OSB: aspen	Strongest of any listed, according to USFS projections	Premium HW: Offshore. OSB: Canada	Variable
Secondary Products, including furniture	many	Highly variable; furniture: mild, niches: strong	High	None
Emerging and Novel Products	Many	Uncertain	Modest	Variable
Pulp and Paper	Most	Stable to declining; grade-dependent	High	High
Biomass for energy	Most	Uncertain; dependent on natural gas and public policy	None	High

I. Global Forces: New England's Place

New England contains only about 6% of the nation's commercial forest land. While it is a major paper producer, its role in other product categories is quite small. For this reason, whatever the future holds, New England's future wood based industry is not likely to be demand-constrained. One assessment (WWF 2012) poses a scenario in which world wood consumption grows by threefold in 50 years. Paper use per capita is nominal in much of the world, and much of the world's population is ill-housed to put it mildly. In the so-called "BRICs" – Brazil, Russia, India, and China – some would add Indonesia— recent economic growth has created expanding middle classes whose symbols of success, among other things, includes a large western-style house. As major timber producers, Brazil, Russia, and Indonesia are likely to increasingly absorb their expanding timber production in their own internal markets – in time. India and China are likely to remain in fiber deficit – on a truly massive scale -- for a very long time.

From a fiber supply standpoint, New England is really two regions. First is the Industrial forest of the north, which is now producing very near to its annual capacity under current management. Second, is the balance of the region – southern Vermont and New Hampshire and Southern New England – where large fiber surpluses exist, but are difficult to mobilize due to fragmented ownerships and landowner lack of interest in management. Even extremely optimistic assumptions about future management intensity will not change this basic reality. This is important because many new and emerging technologies using wood – whether for energy or for engineered products -- are capital intensive and require large volumes of feedstock. Some are energy intensive as well. Couple this with the well-known resistance to industrial development in many parts of the region, this means that if such plants enter the marketplace they will probably do so in other parts of North America that are more cost-competitive.

New England is close to large markets capable of absorbing many times its own production of virtually anything. Yet, even though it is on the water this does not translate into competitive advantage over other continents due to the low costs of water shipment. And the new generation of immense "post-Panamax" ships will further improve the cost position of offshore competitors.

All of these facts suggest that New England's future as a wood producer will increasingly be one of smaller, specialized, market-oriented firms and not large-scale commodity producers. These will be more labor intensive per unit of wood, but increasingly automated to offset high labor costs and to supply higher product quality and higher conversion ratios. A future where the region's forests produce higher proportions of quality logs and valuable species will be the one for which these firms are looking.

A conspectus of the product groups as they may be affected by future change is given in Attachment 1 below. There, we briefly summarize global and regional demands and questions that will arise about the future.

Our conclusion from this exercise is a simple one. We know that forecasting individual product groups over 50 years is beyond human abilities. The uncertainties are simply too great. But we also know from experience that when available wood supplies are documented, some industry arrives to use those supplies. Over this future period then, we can predict that a demand for wood will continue to exist in New England –we just cannot predict the specific forms of products for which it will be used.

J. Current Economic Activity Based on Wood, (2007)

At a time like this, following a historic decline in markets for many wood products, defining a “present” as a basis for assessing the future is difficult. Even an average of several years might not depict a useful “normal” baseline condition for employment and production. Currently many product markets appear to be on the mend. But in cyclical industries such as these, and facing the national economy’s many uncertainties, if there is indeed a “new normal” it is not easy to define statistically. More generally, the “new normal” might be seen as volatility, unpredictability and slow growth. Despite these uncertainties, we need to present some statistical summary of jobs and economic activity. The 2007 Census of Manufactures supplies a set of information that will suit the purpose⁵ (Table 4).

Regionally, in 2007, this set of industries accounted for 33,500 jobs, and \$8.3 billion in product value. The total value added (a concept similar to Gross State Product) was \$4.2 billion. Probably at the 2005-06 peak, these figures were significantly higher. If the estimated amount for 2007 product value were to be escalated by the Producer Price Index to 2013, it would be \$9.8 billion.

These are quite small shares of Gross State Product, especially in the southern half of the region. But in local communities and in rural areas, these jobs are critical to local people. .

⁵ This information is subject to important limitations. To summarize, the data report only employees, and not owners; in fields such as logging, one-person woodworking and craft occupations, and seasonal sawmilling this leads to major undercounts. Also, there are small industries making sporting goods and toys that may show up in other categories than we have reported. Also, several paper mills included in these estimates do not use wood from the region. Based on past experience, even far more detailed and elaborate efforts to drill into federal statistics might not yield much more accurate information. Even in the event of success, the data would still be years old.

Table 4. Economic activity generated by New England forest-based industries, 2007

2007		New England	All but Maine	Maine
Jobs				
113	Forestry & logging	3,759	849	2,910
3211	Sawmills and wood preserving	4,159	2,233	1,926
3219	Other wood products	10,721	8,308	2,413
3221	Pulp, paper and paperboard mills	11,282	5,567	5,715
337122	Wood furnishings - residential	3,475	3,022	453
337211	Wood furnishings - office	114	114	-
	<i>Total</i>	<i>33,510</i>	<i>20,093</i>	<i>13,417</i>
Value of shipments (\$000)				
3211	Sawmills and wood preserving	656,170	65,645	590,525
3219	Other wood products	1,742,508	1,336,573	405,935
3221	Pulp, paper and paperboard mills	5,474,970	2,317,733	3,157,237
337122	Wood furnishings - residential	397,246	347,238	50,008
337211	Wood furnishings - office	14,219	14,219	0
	<i>Total</i>	<i>8,285,113</i>	<i>4,081,408</i>	<i>4,203,705</i>
Value added (\$000)				
3211	Sawmills and wood preserving	356,404	172,205	184,199
3219	Other wood products	894,437	656,934	237,503
3221	Pulp, paper and paperboard mills	2,707,209	1,315,392	1,391,817
337122	Wood furnishings - residential	183,633	183,633	0
337211	Wood furnishings - office	8,752	8,752	0
	<i>Total</i>	<i>4,150,435</i>	<i>2,336,916</i>	<i>1,813,519</i>
Volume of harvest (MM cords)				
		8.2	2.3	5.8
Available timberland (acres)				
		28,193,503	11,874,623	16,318,880
Ratios:				
	Jobs per MM acres available timberland	1,188	1,703	823
	Jobs per MM cords - current	4,112	8,661	2,297
	Value shipments per job (\$000)	247.24	203.13	313.31
	Value added per job	123.86	116.30	135.17
	Value shipments per acre timberland	294	344	258

Data Sources: US Census Bureau, American Fact Finder, 2007 Economic Census, Manufacturing: Geographic Area Series

K. A Positive Scenario for Forests and Forest Products in 2060: How to Get There

New England's forests have excellent potential to support a robust and diverse forest products industry that integrates into and supports the region's economy. Success in retaining and growing this industry relies upon several critical factors, all of which will require broad and coordinated action. They cannot be accomplished by any one group of actors within the forest community. Further, these are presented not as predictions but as aspirations and may provide a blueprint for where New England's forests can head.

- **Retaining as much working forestland as possible.** As New England has grown, a significant amount of forestland has been lost to development. The core foundation of a robust forest products industry is well managed forestland; nothing is more important. Efforts to increase conservation of working forestland, engage landowners in forestry, and retain the social license to practice forestry are core to the future of the industry.
- New England is fortunate to have a diverse range of forests, species and markets. **Sustaining this diversity – and expanding it where necessary** – allows the greatest opportunity for improved economic opportunity. Many parts of New England have a range of markets for both high-value logs and lower valued pulpwood and biomass. However, some regions – notably Southern New England – lack sufficient markets for low-grade wood. Expansion of markets in this area could provide enormous opportunities for improved forest management in these regions.
- Focus management efforts on **growing wood of recognized premium species for quality** while taking advantage of markets for biomass and smallwood to support and enable improved silviculture.
- **Small firms** often provide the best and most realistic opportunity for industry growth. While large projects often receive the attention of the press and government officials, they are often met with local resistance and never get built. Instead of working to develop large projects, many regions of New England would be well suited – both culturally and from a wood resource perspective – to focus on opportunities for incremental growth.
- **Distributed generation** of both thermal and electric energy may present opportunities for biomass to be utilized in community scale setting. These can meet the energy needs of institutions, businesses and citizens through biomass-based district heating, wood for central or supplemental heating, and co-locating new biomass generation with significant heat loads. This has recently been done at a paper mill in the region and is proposed for a wood pellet manufacturing facility.
- **Worker training** is a critical need in much of the region. Modern wood working plants employ costly and complex machinery that is a world away from the traditional, labor intensive processes. High skill levels are needed to handle maintenance and to operate and maintain the kinds of electronic equipment depicted on the cover of this report.
- Building this industry requires **entrepreneurs**. This may prove to be a key constraint. Many entrepreneurs are reluctant to start firms in established and mature markets; it is new and emerging markets that provide the growth opportunity they are looking for. Additionally, manufacturing businesses are often capital intensive and significant investment is required simply to test a market; this stands in stark contrast to information-based products and other sectors that have been attracting

entrepreneurial talent. Enticing individuals to enter the forest products industry will likely require individuals willing to adopt new business models, develop new products, or otherwise attempt to disrupt a mature market.

- The region has a significant over-reliance on imported wood products. **Encouraging the purchase and use of locally grown wood products** could help moderate this situation. One of the challenges for this strategy is that many wood products are long-lived – a dining room set can last for decades, a house for generations. Local purchasing has a greater chance to flourish when purchases are frequent, such as food. A consumer-based “Buy New England” campaign may be best suited for frequently consumed products, such as tissue or perhaps wood pellets.
- A range of **certification** programs could play useful roles in this process.

L. Potential Economic Scenarios: a Thought Experiment

The notes on the past 50 years at the opening of this paper suggest how difficult the task of prediction can be over such a time span. As one wise individual noted, “prediction is difficult -- especially when it concerns the future”. Nonetheless, we think it is useful to explore several scenarios relating our estimate of future wood production potential to the opportunities this could create for jobs and economic activity. This should be seen as a “thought experiment” and not as a forecast.

Key variables in this scenario-writing are:

- The area of working forest that is retained in 2060
- The average growth on those acres
- The jobs created per unit of wood harvested.

In each case, these vary across the region, from north to South and east to west, based on different forest resource traits and local economic situations. We use separate ratios for Maine and the rest of New England (see Attachment 2), but report only regional totals. Further, we treat wood in cords, and make no attempt to assess the impacts of changing mixes of production between different product forms, e.g. pulp vs sawlogs. As a result, this assessment underestimates the potential impact of upgrading the value of the forest over this period. We also assume that the mix of wood used in-state and exported does not change. To simplify this experiment, we assume that all estimated growth is actually harvested – which will plainly not occur, but this assumption does not affect the broad purpose of this exercise.

Table 5. New England total: Range of possibilities for future employment

	Scenario	Volume growth cords/acre	Available for management MM acres	Total growth (harvest) MM cords	No. of jobs
Current		0.39	28.2	11.6	33,510
				(8.2)	
Future	Low growth low area	0.50	22.0	11.0	19,855
2060	Moderate growth low area	0.75	22.0	16.5	29,783
	High growth high area	1.00	29.2	29.2	52,706
	Jobs per MM cords:				
	Current	4,112			
	2060 projected	2,429			

This set of scenarios (Table 5) tells us several things. First, if the forest resource is allowed to slip away, sustaining the region’s wood based economy will be compromised. Maintaining production, in fact, will require improved management to upgrade growth (and quality) in order to sustain current production and employment. Second, if higher growth rates can be achieved, as well as slightly increasing the region’s area of working forest, the potential wood production could be as high as three times present levels. We are not predicting that this level will be reached, only using it as an illustrative scenario.

This range of potential outcomes for wood production affects a correspondingly wide range of possibilities for jobs and economic activity based on the forest. The ratio of jobs per unit of wood cut is currently dominated by the high production paper mills and large sawmills. Over a 50-year period, average labor input per unit of wood used could fall by 50% or much more. On the other hand, if our version of the future is on the mark, future businesses will be smaller, more specialty-oriented, and likely will require more labor input per unit of wood used than do high production mills. Already, the highly automated spruce fir mills produce a million feet of framing lumber per year per employee – and this includes the back office. Surely small and medium sized wood using plants will never reach this level of production per worker. There so many potentially offsetting trends that trying to account for them all would yield an awkward analysis that could hardly yield more precision as to events 50 years in the future.

M. Conclusion

As documented earlier, New England's forest products industry is a significant part of the region's economic base, particularly in rural areas. Looking to the future, the forest products industry in the region has both significant competitive advantages and faces significant challenges. Regarding advantages, they include the following:

- Regarding the character of the industry itself:
 - Proximity to markets – the region lies within a few to five hundred miles of the Boston to Washington, DC “Northeast Corridor,” with a population of over 44 million people, as well as large urban areas in Eastern Canada.
 - A wide diversity of firms and products already represented
 - A track record of creativity on the part of many forest products businesses and a “can do” attitude
 - Existing mills which are already capitalized
 - The makings of a forestry “industry cluster,” including R&D capacity in both forest management and manufacturing
 - Large ownerships in portions of the region, particularly northern New England, that have the potential to facilitate a secure supply of raw material
 - Success in keeping forests as forests, as a result of the widespread support this cause has received and the creativity employed by its advocates, as well as the financial support provided to landowners by the existence of a diverse forest products industry and the expectation that it will persist
 - Diminished competition from some other sources of wood (e.g., tropical hardwoods from native forests), if international and market pressure for conservation of biodiversity and sensitive ecosystems continues to mount and becomes better reflected in the market
- Regarding natural resources – advantages include:
 - Unrealized potential for increasing both growth in volume and in the quality of timber produced (see the companion paper on potential forest productivity).
 - Natural competitive advantages regarding sustainability – these include:
 - Abundant natural regeneration
 - Extremely durable geology and stable soils – hence, reduced erosion
 - Plentiful rainfall during the growing season
 - A wide diversity of commercial species
 - A history of management

Thus, the ability to provide sustainably produced wood products with minimal environmental impacts in highly resilient forests

- Climate change effects on forests that are predicted to be less calamitous than elsewhere in the world (e.g., the widespread mortality in forest stands of the western US and Canada)

Challenges for the region's forests products industry include the following:

- **Crafting a vision for the future** of forest management, the industry and the related forest base which can be **broadly supported by both the industry and conservation organizations** – this is fundamentally important
- Climate change and how will it impact wood markets, the environment in general, forest growth and composition, and the industry
- The global move toward maximum efficiency in the forest products industry, an efficiency measured ultimately by price (note that this is particularly important for large-scale producers and commodities)
- In southern New England the loss of much of the forest products industry and local markets for timber
- Small ownerships in southern and central New England which present challenges to logging profitability and securing adequate and dependable supplies of timber
- Low productivity per acre and a low proportion of quality wood
- A very large number of small woodlot owners with a wide range of needs and motivations
- A culture of “independence” which sometimes impedes fruitful collaboration
- Energy costs which are high compared to many other regions of North America -- the forest products industry is often very energy-intensive
- Continued and perhaps increasing competitive pressure from plantations of tropical hardwoods

In addition to these “knowns,” there are a number of unknowns that may either provide additional advantages or challenges. These include:

- Changes in technology, which may or may not work to the benefit of using small diameter and low quality trees, particularly in engineered wood products
- Attitudes and buying preferences of tomorrow's consumers – for example, will the trend toward favoring locally produced goods increase or fade away? Likewise, will the interest in and market recognition of sustainably produced forest products increase or diminish?
- Whether or not “new” supplies of timber become readily available, e.g., Siberian timber
- Whether or not tropical plantations maintain or increase their competitive advantage in export markets, especially in solid wood products

- Whether or not the national and international response to climate change places a premium on wood products to displace other construction materials with higher lifecycle greenhouse gas emissions

Given the history of forest industry and current trends, it is easy to envision a future of decline in the region's forest products industry. New England's forest products industry could, as a whole, continue to go the way of what has been experienced in southern New England over a number of decades, and in northern New Hampshire and parts of Vermont over the course of the last 10-15 years.

On the other hand, Maine has been able to retain much of its forest products industry when measured in terms of output, even though the number of jobs in the industry has declined. In fact, a reduction in labor input and costs has proven to be a necessary part of retaining forest product businesses. Without reductions in labor costs, the businesses cannot remain competitive.

Building from the Maine experience, it is also possible to envision a future where the forest products industry is more diverse and productive. It would involve:

- Support for the industry and forest management from conservation organizations and the public. This support hinges upon a shared understanding of the alignment between a healthy forest industry, protection of environmental values and a healthy, sustainable region. Examples: 1) financially successful woodlot owners tend to retain their forests as forestland rather than developing their property, thus ensuring environmental values are protected and a local forest products industry continues; and 2) increased use of forest biomass to replace fossil fuels can help meet long and short term carbon emissions goals for mitigating climate change.
- Keeping forests as forests and maintaining a large proportion of them as working forest lands.
- Increasing the productivity of New England's forests lands – not just in terms of volume of material produced, but more importantly timber quality. The quality of timber produced is largely within our control and can be dramatically enhanced through improved silviculture, and the diverse markets necessary to support this management.
- Cultivating entrepreneurial talent and behaviors within the forest products industry in firms both large and small. This should include building from the region's existing strengths to develop a stronger creative forest products industry cluster within the region.
- Focused training for workers to build skills for the more mechanized and electronically driven plants of the future.
- Retaining, to the maximum extent possible, the large manufacturers remaining within the region. Even in the case of large firms, this is likely to require finding niche markets for their products.
- Strengthening and diversifying the forest products industry in southern New England – one well suited to the timber resources, ownership patterns, and public attitudes of that region.
- Engaging small landowners, not only in southern New England but throughout the region, in active forest management, **including sustainable timber harvesting**, to help supply the region's demand for wood as an element of environmental responsibility.

- Developing a reputation for leadership on sustainability. Sustainability in forest management, as well as sustainability in manufacturing (e.g., emphasizing the use of recycled materials, substituting wood for materials with higher lifecycle emissions of greenhouse gases, and using waste wood productively, e.g., using clean wood wastes to replace fossil fuel in generating heat and combined heat and power).

Achieving such a future will not happen by itself – rather it will require focus, determination and creativity. A key part of the effort to achieve this future will be reaching broad agreement among key actors within the forest products industry, forest owners’ community and conservation organizations on a vision for the future that includes both forest management and forest manufacturing that is publically supported. This will require a heightened sensitivity to public perceptions of forest management and an unprecedented level of collaboration among these interests.

N. Reading List on Forest Industry Situation and Outlook

This is a classified reading list for those seeking more detail. It attempts to list only sources that offer broad coverage and in turn summarize large amounts of information.

1. Macro: Global and US Outlook

Buongiorno, Joseph; Zhu, Shushuai; Raunikar, Ronald; Prestemon, Jeffrey P. 2012. [Outlook to 2060 for world forests and forest industries: a technical document supporting the Forest Service 2010 RPA assessment](#). Gen. Tech. Rep. SRS-151. Asheville, NC: US Department of Agriculture Forest Service, Southern Research Station. 119 p.

North American forest sector outlook study, 2006-2030. UNECE Study paper 29.

Ince, P.J. and P. Nepal, Effects on US timber outlook of recent recession.... GTR FPL-GTR-219. Dec 2012. 21 pp.

US Forest Service 2012. Future of America’s forests and rangelands – 2010 RPA Assessment. Gen Tech Rep/ WO-87. 198 pp.

UN Economic Commission for Europe. 2010. Forest products annual market review 2009-2010. 166 pp. (Issued annually)

Sutton, WRJ. (Wink). 10098. The future for wood—will there be demand for wood in the future? (Essay by scientist heavily involved in developing New Zealand’s plantation pine resource). Processed. Available on Web by this title, not sure if formally published.

WWF. Living Forest report, Chapter 4, Forests and Wood Products. Washington. 33 pp.

awsassets.panda.org/downloads/living_forests_report_ch4_forest_products.pdf

(the demand analysis was done by IIASA of Laxenburg, Austria, a respected research institution.

2. Land Use and Ownership:

Harvard Forest. 2010. Wildlands and Woodlands. Petersham, MA. 40 pp.

Berlik, M.M., D.B. Kittredge, and David R. Foster. 2002. The Illusion of Preservation: a Global environmental argument for the local production of natural resources. Petersham: Harvard Forest. Paper no. 26. 23 pp.

Irland, L.C.J. Hagan, and J. Lutz. 2011. Large timberland transactions in the Northern Forest, 1980-2006. Yale Global Institute on Sustainable Forestry Research paper 011, 36 pp.

Irland, L.C. 2011. "New England Forests: Two Centuries of a Changing Landscape" In, B. Harrison and R. Judd, eds. New England: A Landscape History. Cambridge: MIT Press. Pp. 53-70.

3. Resource Outlook

See also the companion paper on potential forest productivity.

USDA FS RPA Assessments make projections for the entire Northern Region, so their projections are hard to use for just New England. A useful regional overview is Shifley, et al., 2012, Forests of the northern United States. USFS Northern Research Station, NRS-GTR- 90.

Irland, L.C. and R.S. Whalley. 1992. Northern forest outlook: a working sketch of regional forest conditions in 2040. In Sustaining ecosystems, economics, and a way of life in the northern forest. Washington DC. The Wilderness Society. Pp. 77-82.

Sendak.P.E.R.C. Abt, and R.J. Turner, 2003. Timber supply projections for northern New England and New York: integrating a market perspective. Northern Jour Appl For. 20(4): 175-185.

US Department of Energy. 2011. *US Billion-Ton Update: Biomass Supply for a Bioenergy and Bioproducts Industry*. R.D. Perlack and B.J. Stokes (Leads), ORNL/TM-2011/224. Oak Ridge National Laboratory, Oak Ridge, TN. 227p.

Hennigar, C.R., et al. 2011. Applying a spruce budworm decision support system to Maine: projecting spruce-fir volume impacts. Journal of Forestry (Sept.)

James W. Sewall Co. 2012. Hardwood resources in the State of Maine. Report to Commissioner, Maine DOC. Feb. 7. 23 pp. processed.

James W. Sewall Co. 2011. Spruce-fir resources in the State of Maine. Report to Commissioner, Maine DOC. Aug. 18. 10 pp. processed.

4. Regional and Industry trends:

Irland, L.C. 2012. Biomass trends in the Northeast 2000-2010. Northern Logger, Nov. pp. 10, 11.

Irland, L.C. Fifty years of Maine stumpage prices: trends, surprises, and lessons for woodlot owners. Northern Woodlands. Summer 2011. p. 43-45.

Irland, "What happened to the Pine market? 50 years (or less) of pine stumpage price history across the Northeast". Northern Logger and Timber Processor May 2011. Pp. 18, 19.

Irland, L.C. “White pine recovery: a slow crawl in the NE”.N. Logger, June 2013.

Irland, L.C. “Comeback in spruce framing lumber markets.” N. Logger May 2013.

Kingsley, Eric. “Biomass markets are diversifying”.N. Logger. Nov. 2013.

Maine Forest Products Council. 2013. Maine’s forest economy. Augusta, Maine: 28 pp.

Mance, David. 2013. “The multiplier effect: rebuilding the wood product manufacturing base on the Northeast”. Northern Woodlands. Autumn. Pp. 58-63.

5. Economic Development

Innovative Natural Resource Solutions LLC. Maine Future Forest Economy Project. Maine Department of Conservation – Maine Forest Service and the Maine Technology Institute. March 2005. 474 pages.

Irland, L.C. 2005. Maine’s forest products sector and regional disparities. *In* L. Pohlmann and D. Vail, eds. Spreading prosperity to the Other Maines: reflections on Regional disparities. Augusta: MCEP November.

Northern Forest Center. Economic resurgence in the northern forest. A regional strategy of the sustainable Economy Initiative. Northern Forest Center, Concord, NH. 20-08. 4 pp.

O. Attachments

1. Estimate of Future Economic Effects of Timber Harvest Levels

Estimate of future economic effects of a range of Potential Timber Harvest levels: New England Total

Based on 2007 relationships

MAINE								
	Wood production MM cords	No. Jobs SIC 24,5,6	1,000 Jobs per MM cd	Jobs/MM cd in 2060	Jobs in 2060	Value Product current \$ thous.	Value of Product/Job	Value of Product in 2060 \$ thous.
2007	5.8	13,417	2,313			4,203,705	\$ 313,312	
2060 Low	5.8			1,358	7,876		\$ 530,896	\$ 4,181,483
2060 High	15.0			1,358	20,370		\$ 530,896	\$ 10,814,181
REST OF NEW ENGLAND								
	Wood production MM cords	No. Jobs SIC 24,5,6	Jobs per MM cd	Jobs/MM cd in 2060	Jobs in 2060	Value Product current \$ thous.	Value of Product/Job	Value of Product in 2060 \$ thous.
Current	2.3	20,093	8,736			4,081,408	\$ 203,126	
2060 Low	2.3			5,128	11,795		\$ 344,190	\$ 4,059,833
2060 High	14.2			5,128	72,823		\$ 344,190	\$ 25,065,054
REGIONAL TOTALS								
	Wood production MM cords	No. Jobs SIC 24,5,6	Jobs per MM cd	Jobs/MM cd in 2060	Jobs in 2060	Value Product current \$ thous.	Value of Product/Job	Value of Product in 2060 \$ thous.
Current	8.1	33,510	4,137			8,285,113	\$ 247,243	
2060 Low	8.1			2,429	19,672		\$ 418,945	\$ 8,241,316
2060 High	29.2			2,429	93,193		\$ 418,945	\$ 35,879,235

Source: Previous tables and author calculations

Logic flows from cords cut times jobs per cord to value of product per job times no. of jobs in 2060.

2060 potential from Potential production report; allocation between Maine and rest of NE LCI and EK estimates for details on low and high wood production scenarios see Table 3 above.

Assume jobs/MMcd declines 1%/yr; production per job rises 1% per yr

Assumes no inflation in real prices of outputs.

2. Matrix of Product Categories Considered and Outlook Factors for the Coming Half Century

Note: product categories are defined in table below.

Category	Demand - Global	Demand - Regional	Supply - Global	Supply - Regional	Advances In Technology / Substitution Issues	What Could Happen	Why This Could Happen	Implications For New England
Solid Wood								
Structural Lumber	Rising because of growing populations and growing middle class; US Northeast not competitive in export markets	Stable; house sizes may decrease Solid wood could retake niche applications such as flooring, moldings, or from nonwoods, or composites.	Imports of European wood will occur during strong markets,	Some increase possible in parts of New England; Competition from Quebec will not return to previous peaks	Continued incremental improvements in wood processing machinery Potential increase in traditional wood framing in larger buildings, timber framing. Novel construction technologies, SIP's etc.	Nationally, houses could get smaller Substitution of wood for nonwood construction could increase	Changing demographics; higher energy costs for heating; expensive land Increased emphasis on green building and GHG reductions	Would not affect New England industry much -- very small part of national production Smaller houses >> less demand for framing lumber; more multi-unit, more demand for EWP. If wood retakes some niche uses, could expand demand.
Rough Timbers	Not traded	steady -- always a need for such material	Not relevant -- not traded	Substantial -- a good use our low grade logs	not relevant -- done in tiny circle- saw mills	Perhaps interest in import replacement by local purchasing could help local mills.	not relevant	Continued demands for these will help forest management.
Millwork	Rising; US Northeast not competitive in export markets	Stable; house sizes may decrease	Slowly rising	Small, and not likely to increase	Improved overlays and MDF moldings likely as not to erode wood's market share	Competing materials and processes further erode wood's market	Unpredictable	Limited as import market share already very high; suitable grades of both hard and soft woods have strong markets
Appearance Hardwood	Rising because of growing populations and growing middle class	Stable	Rising, esp. with growth in tropical plantations producing more solid wood e.g. eucalyptus	Modest now -- could be increased with improved forest management	Success in overcoming grade, finishing, drying problems in tropical short rotation hardwoods could provide serious competition	Many things... not all good for demand for local woods. See entries to left. Natural wood finishes could return to prominence.	Forest management could be improved, leading to improved availability of valuable species in larger logs	Markets should remain strong for quality lumber, given region's small share -- so long as firms produce and market for specialty high end markets instead of selling lumber as a commodity.

Category	Demand - Global	Demand - Regional	Supply - Global	Supply - Regional	Advances In Technology / Substitution Issues	What Could Happen	Why This Could Happen	Implications For New England
Utility Products, e.g., pallets, etc.	Rising because of growing populations and growing middle class	Stable	Rising, esp. with growth in tropical plantations producing more solid wood	Stable	Unclear	Shift away from Chinese imports could revive pallet markets in US; other pallet-intensive businesses could revive, e.g. food processing.	Reshoring	Local uses for these items continue to exist; they supply important markets for logs, both soft and hardwood.
Panels	Growth moderate to strong because of growing populations and growing middle class	Growth slow to moderate	Steady moderate growth; tropical hardwoods will shift to secondary species, and even plantation wood.	Little growth likely; hardwood plywood constrained by log supplies; structural panels by limited fiber supplies, high costs, distance to market	Technologies are mature; incremental improvements likely. Adhesives likely to be an issue for cost and health concerns.	If new technologies, such as slicing, could make competitive veneer processing possible at very small scales, local plants could emerge.	Depends on technology.	Region likely to continue exporting its best veneer logs; this will offer good prices to owners. Growing for quality will continue to be rewarded
Secondary Products, e.g., furniture (?)	Will rise strongly as emerging nations pursue American living standards	Modest, tied to housing starts/sales	Near term, a continued competitive threat. Long-term impossible to forecast	Northeast is high labor cost region; volume production likely to continue to shrink; specialties will rise. Much wood used is from outside region	Specialties likely to continue to be skill-intensive, small firms. Less new technology than adoption of existing tools/methods	Region could shift to use more local wood.	Consumer tastes for local woods; incentives in purchasing policies etc.	Improve markets for locally grown high value hardwoods
Engineered Wood	Likely to rise; will vary by continent. Could really take off to reduce GHG levels	Steady markets. Could really take off to reduce GHG levels	Likely to rise	Stable. Could increase if new processes prove cost competitive at very small scales.	Technologies maturing; likely to increase minimum scale of plants	If markets emerge for high value, small scale specialty production (e.g. FRP glulam), plants could emerge here.	No particular reason to expect this.	New England will become less competitive in these products, or if a market develops for engineered products from low value and small wood, it would create demand in New England that could enhance silviculture.

Category	Demand - Global	Demand - Regional	Supply - Global	Supply - Regional	Advances In Technology / Substitution Issues	What Could Happen	Why This Could Happen	Implications For New England
Panel Products	Rising	Stable; tied to housing, secondary, Repair/remodel markets	Rising	Stable to declining	Likely to increase advantage of high production plants, to disadvantage of New England	Specialty, small scale plywood production based in local corestock, imported veneer is possible.	Firm-dependent - the right people could make it happen. Small business.	No clear picture
Pulp & Paper								
Market Pulp	Steady, though changing from North America to emerging markets	limited and shrinking	Stable to increasing, particularly as some mills cease paper production to focus on pulp and try to find new markets	Challenged as pulp from other regions - with lower fiber costs, energy cost or economy of scale - enter the market	Shrinking US market for paper will make this a diminishing opportunity; retaining cost-competitiveness in export markets is not assured.	Existing infrastructure and fiber profile allows for profitability in niche markets	Legacy mills will try to find ways to remain viable, and may seek specialty markets utilizing existing assets	Generally shrinking opportunities, but not immediate. New England mills will be challenged to stay in business in the long term.
Printing & Writing	Modest near-term increases, focused on developing nations based upon economic growth	Decreasing as technology substitutes for paper in many applications	Keeping pace with demand, in many cases over-supply	Decreasing - though slowly - as market shrinks	Primarily challenged by loss of printed material, as trend toward electronic communication increases	Mills could lose market faster than expected, with adoption of electronic media accelerating regionally and globally	Tablet and computer adoption in developing countries could skip any opportunity for interim paper market	Loss of machines and mills over time, but may be offset by some mills optimizing production and taking advantage of proximity to customers
Tissue	Increasing demand as incomes rise in developing nations	Relatively stable, highly correlated with population changes – New England expected to have slow growing population	Increasingly met by local production, given cost of shipping an extremely bulky product	Current and new investments in tissue production may meet - or exceed - regional demand; limited opportunity for expansion beyond currently planned	Greatest threat is substitution of recycled paper or imported pulp as a feedstock, displacing market for pulpwood	Slight growth in demand regionally, correlated with population, but threats of overcapacity and substitution of market pulp	Pulp is a global commodity and ships well - no reason pulp needs to come from a local market in order to meet this market demand	Important and on-going market, but - after currently planned expansions - generally limited growth opportunities
Energy								

Category	Demand - Global	Demand - Regional	Supply - Global	Supply - Regional	Advances In Technology / Substitution Issues	What Could Happen	Why This Could Happen	Implications For New England
Biomass Electric	Electricity is a product that must be locally produced, global demand not relevant	Electricity growth steady, but not necessarily met with biomass and policy support for biomass electric is eroding in some parts of the region	Electricity is a product that must be locally produced, global supply not relevant	Significant regional supply but may not be used for this purpose, given competitive position with natural gas and wind	Natural gas and wind - challenge economics of biomass.	Existing units continue to operate for a period of time, some units retire, any new units driven by policy demands or development of new technologies could overcome obstacles to greater use	Overtime policy support for traditional biomass power is likely shrink. For renewables, new wind apparently more attractive to investors than new biomass; RPS growth likely met with wind	Decrease in a market for low-grade wood, and for areas lacking a biomass market currently loss of opportunity for new markets
Biomass Thermal (including pellet)	Opportunity in locations largely dependent on oil, but most demand met with local resources	Significant increase in demand, based upon region's high dependence on oil for heating purposes	Biomass increasingly becoming a global commodity, but generally shipping to locations without forests	Strong supply potential, need for increased supply infrastructure in some parts of the region (esp. population centers)	Changes in price or distribution of other fuels (e.g., increased availability of gas or decrease in oil price) can make biomass thermal less attractive	Biomass becomes an increasingly common heating platform for residential, community scale and small commercial / industrial applications currently served by oil	Decreases in appliance cost and new business models bring ease-of-use and fuel security to customers	Large new seasonal market, with complicated seasonality and logistics concerns (number of customers) not currently faced by industry
Wood Pellet Export for Utility Use	Significant increase in demand for bulk pellets - primarily driven by policy mandates in UK and EU. There is concern that these mandates will not continue	Not relevant for export model	Strong competition from global wood baskets proximate to shipping, including US South, Brazil, Canada	Some opportunities to take advantage of shipping proximity to UK and Northern Europe, but limited by cost and competition for feedstock	This market is largely dependent upon public policy in foreign jurisdictions; could change quickly if cost or other factors become problematic	A few pellet mills built to serve this market, augmented by any over-capacity from existing / new thermal pellet manufacturers	Shipping cost benefits partially offset higher feedstock costs in this region	Potential new market in a few locations proximate to appropriate ports, but not growth like currently seen in Southeastern US

Category	Demand - Global	Demand - Regional	Supply - Global	Supply - Regional	Advances In Technology / Substitution Issues	What Could Happen	Why This Could Happen	Implications For New England
Wood-Based Liquid Fuels	Very significant demand for transportation, thermal and value-added uses	Significant demand for thermal and transportation, no in-region refining capacity	Emerging technology group, with extremely limited commercial success to date	Despite significant R&D efforts, limited commercial development; expected to change soon	Will require scaling and development of conversion technologies not yet proven at commercial scale	Small to mid-scale development occurs as technology improves, limited opportunities for large-scale development	Proximity to market primary advantage of region, offsetting fiber cost challenges. Facilities use existing infrastructure in many instances	Some development of new markets as technology matures, but region not well suited for large-scale production facilities envisioned by some energy companies
Biomass Combined Heat & Power	Electricity and heat are products that must be locally produced, global demand not relevant	Many industrial users and large institutions are well suited for CHP applications, biomass is one option for a fuel source.	Electricity and heat are products that must be locally produced, global supply not relevant	Wood and infrastructure exists and is ready to serve this market	Greatest near-term competition from trucked natural gas in areas without a natural gas pipeline	Many rural and mid-sized institutions and industrial users convert to biomass, large users convert to trucked natural gas	Cost of energy (heat and electricity) is the primary driver, trucked natural gas needs certain size parameters to be economic	Opportunities for significant new market, but distributed regionally, and with seasonality and logistic challenges

DEFINITIONS OF CATEGORIES *	
Structural lumber	Framing lumber, 2X4, 2X6, etc., usually spruce-fir.
Rough timbers	Processed for local use, sold green, usually in open air small mills, and used in rough construction of one kind or another. Often an outlet for low valued species such as beech, or low grade logs. Grading is rarely applicable.
Millwork	Much higher grade white pine is used for this purpose -- moldings and window casings and parts. Popular hardwoods used more increasingly this purpose as well; flooring is also an example.
Appearance hardwoods	Popular hardwoods -- oak, maple, yellow birch -- used for furniture and related uses
Utility products	Generally hardwoods, but occasionally softwoods, at times shipped dry. Crating, dunnage, specialty containers, and pallets would be examples. Mills are larger and more specialized than for rough timbers.
Secondary Products	Items such as furniture, furniture parts, or cutting boards that are processed beyond the stage of lumber
Panels	Products such as plywood, particleboard, and medium density fiberboard (MDF). No structural plywood is produced in Northeast US. Particleboard and MDF are produced in nearby Canada.
Engineered Products (EWP)	Glued laminated timber (glulam) beams; wood I-joists; parallam® beams, CLT. None currently produced in the Northeastern US.

* Note: The categories are not tidy; they are based on uses rather than on species