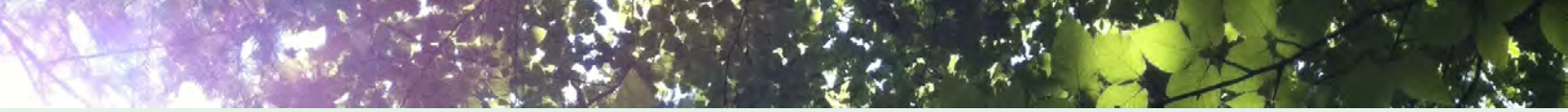


the ECONOMIC IMPORTANCE of MASSACHUSETTS' FOREST BASED ECONOMY 2015

North East *State* Foresters Association

I. Introduction

Thank you for your interest in and taking time to read about the "Economic Importance of Massachusetts's Forest-Based Economy 2015". It is intended to provide its readers with insightful information on the history, facts, and trends of the forested resources that can be used by all to provide a picture of the state of the Commonwealth's Forest-Based Economy.

Peter Church
Director of Forest Stewardship

The Commonwealth's forested landscape has experienced many changes since the arrival of the Pilgrims at Plymouth Rock. Early settlers began to clear the forest for agricultural use. Clearing continued and increased in intensity through the mid-nineteenth century. As settlers moved west, farms were abandoned and much of the cleared farmland began to revert back to forests. Throughout this period the forest has provided many forest products and other benefits.

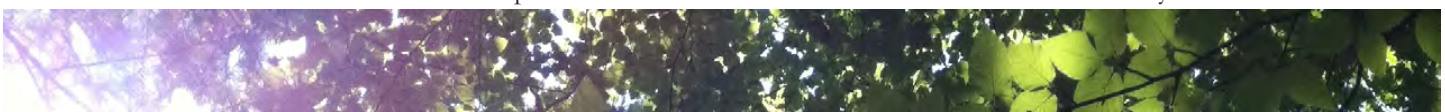
Today, the Commonwealth's forested landscape comprises 61% of the total land area, estimated to be a third less than when early settlers first arrived. The majority (64%), is owned predominately by private woodland owners. Trends indicate a decrease in the amount of forest cover, primarily due to land use conversions. Trends also indicate that the average annual net growth of the forest is increasing and far exceeds the amount harvested annually. Forest health is being impacted by the spread of invasive pests (i.e. - Hemlock woooly adelgid, Asian longhorned beetle, and Emerald ash borer), plants (i.e. - autumn olive, buckthorn, Japanese knotweed, bittersweet, garlic mustard), and the uncertainty the effects of climate change will have on our forests.

In addition to what is typically thought of as being included in a forest-based economy (i.e. - lumber, pulp and paper, furniture and other related secondary manufacturing, Christmas trees, maple syrup), wood based energy (i.e. -firewood, wood pellets, wood chips) -- forest-based recreation / tourism are also important components of the Commonwealth's forest-based economy. Trends indicate Massachusetts has a smaller, but significant and more efficient forest-based wood manufacturing economy than decades ago and a growing wood energy and recreation/tourism economy.

Continuing to work with the Commonwealth's private woodland owners to keep forests as forests and to manage their woodlands sustainably will continue to be a key component in our support of a forest-based economy.

Thank you,
Peter Church
Director of Forest Stewardship

Acknowledgements: Funding for this report was provided by the North East State Foresters Association through a grant provided by the USDA Forest Service, State and Private Forestry



II. Executive Summary

• Forest area and species – **Massachusetts's forests cover 3,035,792 acres** of land or **61% of the State** and have largely been at this level since the 1980s. **Northern hardwood, oak and white pine forests make up over 88%** of the forest cover.

• Forest ownership – Massachusetts's forests continue to be largely privately owned by **individuals/families and business who together own over 64% of the forest.** The state owns approximately 20% of the forests and local government owns 13%.

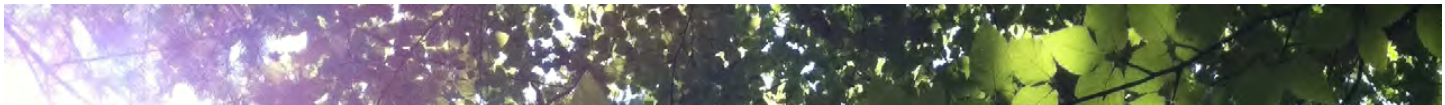
• Forest inventory, growth vs. harvest – The forests of Massachusetts continue to add to the inventory of tree volume as net growth significantly exceeds harvest annually. Currently, **Massachusetts's forests grow 150.8 million cubic feet (4.8 million tons) per year while approximately 27.9 million cubic feet of timber is harvested annually.** This means that only 18.5% of annual growth is being harvested. Massachusetts's standing forest contains 4.9 billion cubic feet (155 million tons) of timber 5 inches in diameter or larger.

• Value of forest industry economic sectors (see table below) – The annual Gross State Output of **Massachusetts's forest products industry totals nearly $ 3.0 billion while the forest-based recreation economy generates approximately $2.2 billion annually.** Approximately **17,000 workers are employed in the forest products, maple and Christmas tree sectors** while another **9,000 jobs are found in the sectors that include and support the forest recreation economy.**

Gross State Output (sales), Forest-based Manufacturing & Recreation, Massachusetts, 2013			
		millions of $	**jobs**
Forestry & logging		62	1,003
Wood products manufacturing		452	2,900
Furniture and related product manufacturing		929	4,600
Paper manufacturing		1,573	8,500
Wood energy		24	75
Christmas trees and maple syrup		5	58
Total Forest Products	$	3,044	17,136
Forest Recreation sales	$	2,200	9,000
	Total **$**	**5,244**	**26,136**

Sources: Sources for the table above can be found throughout this document.

Note on economic multipliers – This report does not use economic multipliers for the forest products industry data though the forest recreation data is derived from a multiplier-like data source. Economic multipliers account for the ripple effect that economic activity in a particular industry causes through the economy. Using economic multipliers usually increases the value of employment, payroll, gross domestic product, or sales by 1.4-1.6 times their non-economic multiplier value.

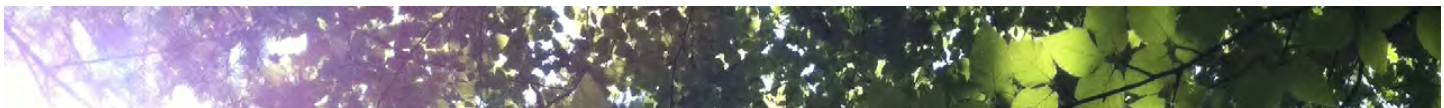


• **Economic output and number of jobs in the forest products sector have been reduced since peaks in the early 2000s**. This has mirrored similar trends in other manufacturing sectors in the U.S. as more and more manufacturing has moved to other parts of the world.

This report is the first of its kind for Massachusetts and is similar to a series of reports that have been published for Maine, New York, New Hampshire and Vermont by the North East *State* Foresters Association since the early 1990s. Its purpose is to capture the economic value of the forest-based economy of the State and provide analyses of trends for key economic indicators. The sectors covered in this report include forestry and logging, related trucking, wood products manufacturing, wood furniture and related products manufacturing, pulp and paper manufacturing, wood energy, and the forest-based recreational economy that includes camping, hiking, hunting, downhill skiing, cross-country skiing, snowmobiling, fall foliage viewing, and wildlife viewing.

Data for this report come from federal, state and private sources. For a full list sources, please see citations at the end of this report.

We would like to thank the many people who assisted with the development of this report including Peter Church, Michael Fleming and Gordon Boyce of the Massachusetts Department of Conservation and Recreation.



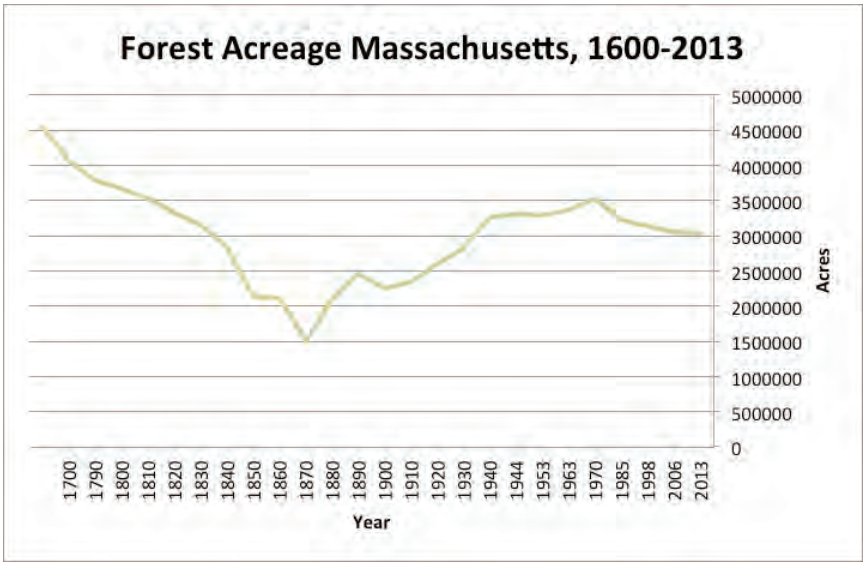
III. The Forest Resource

Forest Area

At 61% forest cover, Massachusetts is the ninth most forested state in the country just behind New York. The northeast U.S. is the most forested area of the country in terms of percentage of land in forests. Of the 3,035,792 forested acres in Massachusetts, 2,901,749 acres, or nearly 96%, are considered "timberland," meaning these lands are capable of producing repeated timber crops.

A long-term forestland acreage trend analysis coordinated by the Harvard Forest shows that Massachusetts' forested area is about a third less than when Europeans first arrived in North America (See Figure 1). It is estimated that in the year 1600 forests covered 4.55 million acres compared to today's 3.04 million. Massachusetts' forests have grown back after reaching a low of 1.5 million acres in 1870. Since a recent peak in 1970, forest acreage declined approximately 500,000 acres (largely due to conversion to non-forest land developed uses) but has leveled off in recent years.

Figure 1

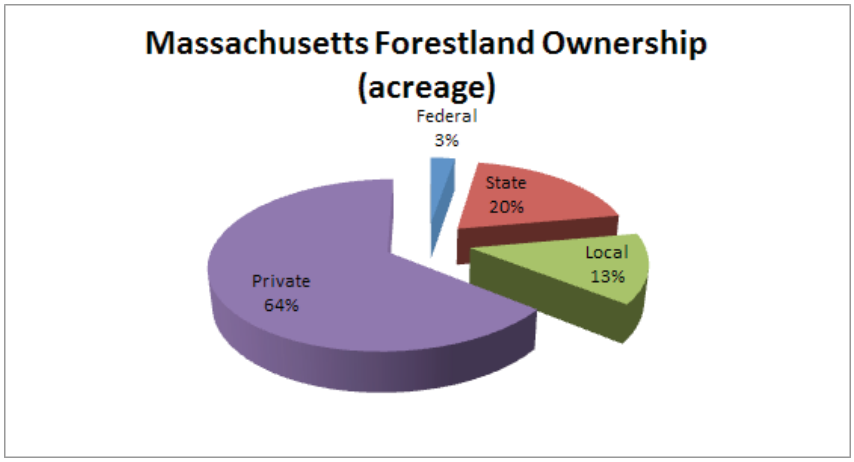


Source: Harvard Forest – multiple data sources

Forest Ownership

The individual/family forest owner sector continues to dominate the ownership of Massachusetts' forest. Over 64% of Massachusetts' forests, or 1.9 million acres, are owned by individuals or families (Figure 2). The State of Massachusetts owns just under 20% or approximately 592,000 acres of Massachusetts' forest. Cities, towns and counties own approximately 13% of the forests or approximately 408,000 acres.

Figure 2

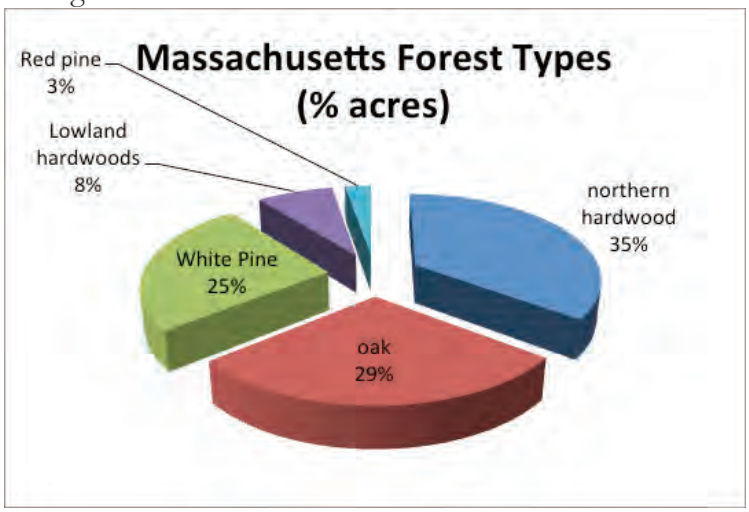


Source: USDA Forest Service, Forest Inventory and Analysis & private data

Forest Types

Massachusetts' forests have a mix of three major forest types dominating the landscape. Northern hardwood (beech, birch, maple) cover about 35% or 870,000 acres, oak covers 29% or 708,000 acres and white pine covers 25% or 625,000 acres.

Figure 3



Source: USDA Forest Service, Forest Inventory and Analysis

Timber Volumes

To understand the volume of wood growing in the forests of Massachusetts, it is most useful to look at inventory trends over time rather than just current volumes. Growth, mortality, harvest levels and loss of forest to non-forest uses determine the overall changes over time. At gross volume levels, Figure 4 shows that standing volume of timber in Massachusetts increased approximately 65% from 1985 to 2013. Standing volume is over 155 million tons of wood in trees 5 inches and larger.

From a timber value perspective, it is important to know what is occurring over time with the sawtimber component of the timber inventory in Massachusetts since sawtimber products are generally much more valuable than lower quality logs (pulpwood, firewood and logs used for wood energy chips). In Figure 5, we see that the volume of sawtimber trees also increased from 1985 to 2013, in this case, by nearly 100%.

Figure 4

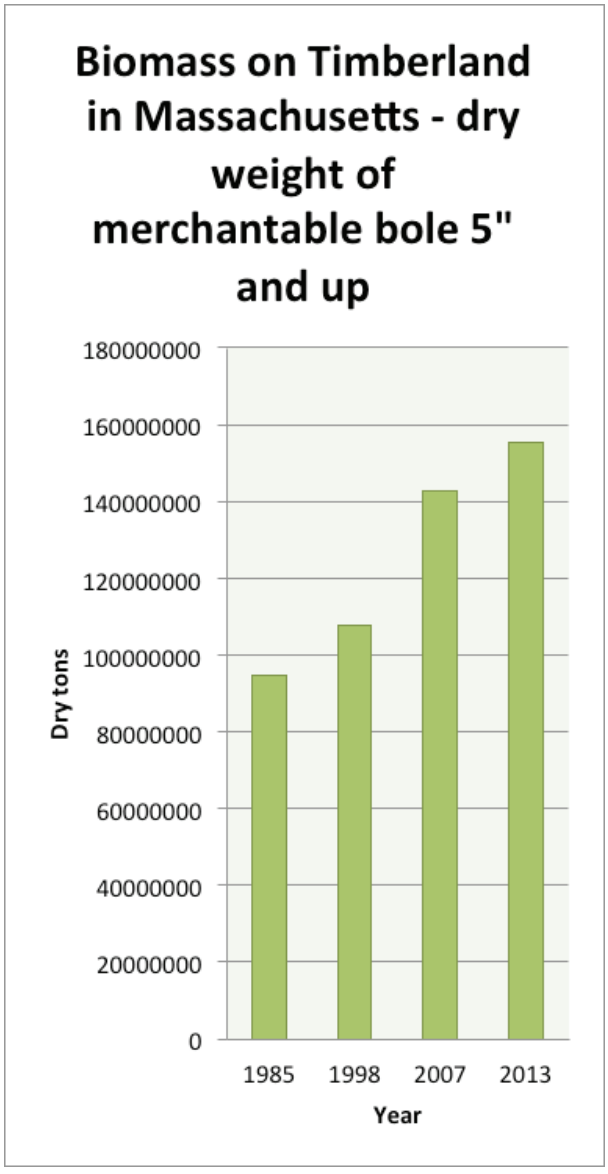
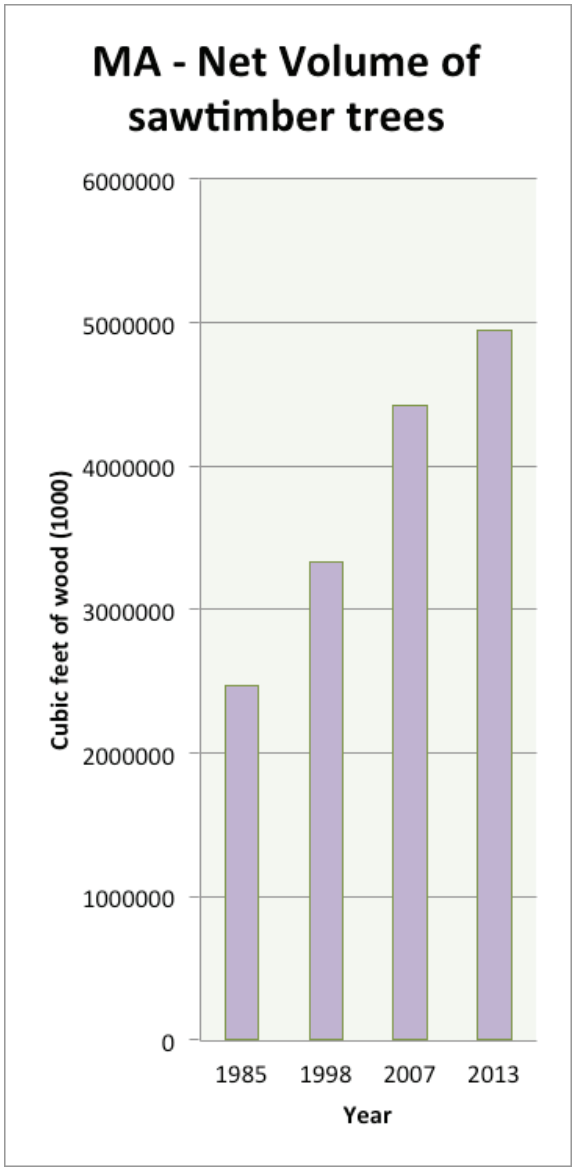
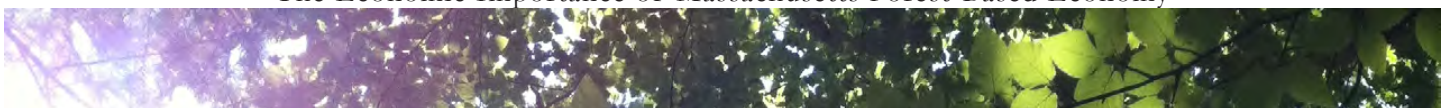


Figure 5



Source: USDA Forest Service, Forest Inventory and Analysis

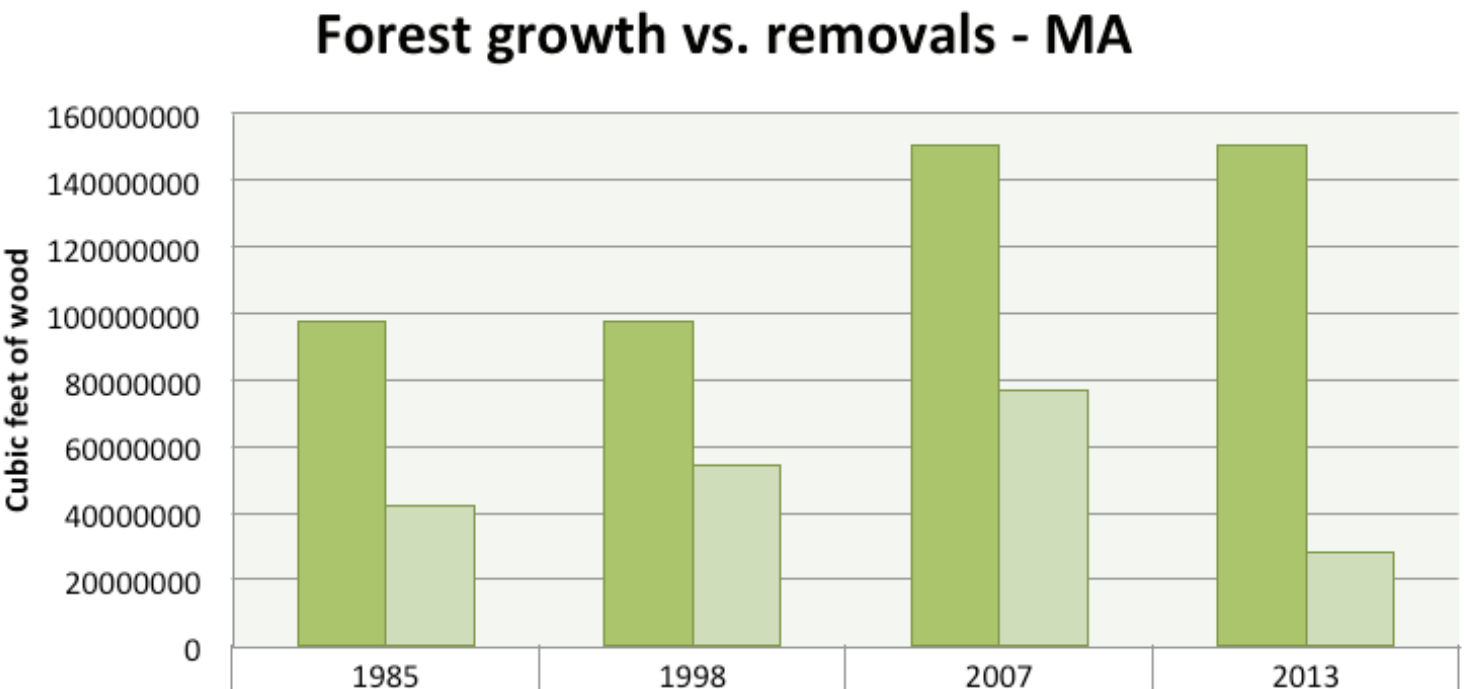


Sustainability - Growth, Mortality and Removals from Massachusett's Forests

In terms of volume and value, Massachusetts' forest inventory is increasing. To understand this better, we need to look at growth, mortality and tree removals. The USDA Forest Service's Forest Inventory and Analysis (FIA), from which much of the data discussed so far in this report is derived, is the best source for understanding growth, mortality and removals. The FIA data set is derived from a series of fixed, on-the-ground plots that are re-measured, roughly every five years. Each on-the-ground plot represents approximately six-thousand acres and has been providing forest data continuously for over 50 years.

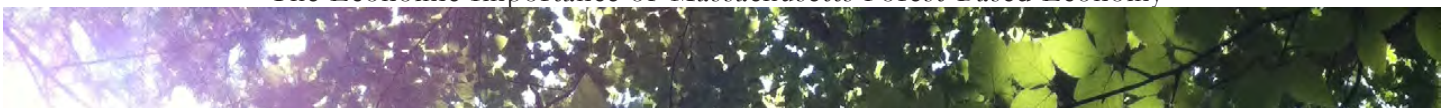
In Figure 6, the current FIA data shows that in Massachusetts' forests, annual net growth is 150.8 million cubic feet (4.8 million tons) per year. At the same time, approximately 27.9 million cubic feet of timber is harvested annually. The difference between the net growth and harvests – 122.9 million cubic feet (3.9 million tons) – is the annual extra growth that accounts for the increasing inventory of trees in Massachusetts. Over the last 30 years (1985-2015) Massachusetts has never harvested more than 60% of its annual growth. The most recent harvest levels have been under 20% of annual growth.

Figure 6



	1985 Average Annual Net Growth of live trees 5"+ vs. removals in MA	1998 Average Annual Net Growth of live trees 5"+ vs. removals in MA	2007 Average Annual Net Growth of live trees 5"+ vs. removals in MA	2013 Average Annual Net Growth of live trees 5"+ vs. removals in MA
Net Growth	97603567	97428006	150302692	150791488
Removals	42263897	54121955	76923290	27929971

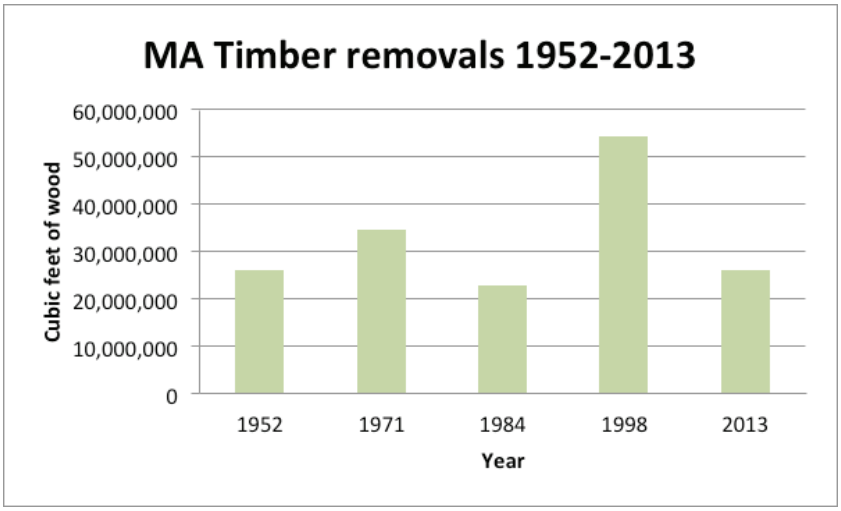
Source: USDA Forest Service, Forest Inventory and Analysis



The difference between forest net growth and harvests is a key measurement for understanding the sustainability of the use of the forest. There are other aspects of forest management, including the factors summarized in a-c below, that further add to understanding the status of forest sustainability in a state.

Timber removal levels over time, from historical data of the USDA Forest Service indicate significant fluctuations in timber harvesting in Massachusetts since the 1950s (Figure 7). An important note in this discussion is that the higher levels of harvesting shown from the 1990s are, most likely in large part, a result of land clearing for development during development booms in the State. These kinds of harvests, for which no accurate records exists, are one-time or "terminal" harvest that results in land changing into a non-forested state.

Figure 7



Source: USDA Forest Service, Forest Inventory and Analysis

a. **Certified forestland** – In Massachusetts, there are over 120,000 acres certified to the American Tree Farm System and over 16,000 to the Forest Stewardship Council's standard. In addition to the sustainable harvest levels discussed above, the voluntary standards of the Tree Farm Program and FSC cover a full range of requirements covering forestry, ecological, economic, and social issues.

b. **Best Management Practices for Water Quality Protection** – The biggest impact to forests, aside from their conversion to a non-forest use, is forest harvesting activities. Truck roads, skidder trails, and presence of heavy equipment are integral to forest harvesting operations. Water quality degradation and soil erosion can result if proper procedures are not followed. Massachusetts, along with virtually all forested states in the country, has had in place for many years voluntary Best Management Practices for Forestry, commonly called best management practices or BMPs. Use of BMPs on forestry operations has become integrated into most forest operations in the last several decades. The culture in the forest industry has changed in that regard – it is simply no longer acceptable to negatively affect water quality or soils in forest operations.

c. **Use of professionally trained foresters and loggers** – The use of licensed foresters and loggers is integral to assuring sustainable harvesting operations. In Massachusetts, all foresters and timber harvesters (loggers) operating where a Forest Cutting Plan is required (as required by the Forest Cutting Practices Act) must be licensed by the state in order to be in business. Under the Act, foresters and loggers must complete continuing education training in order to maintain their certification.

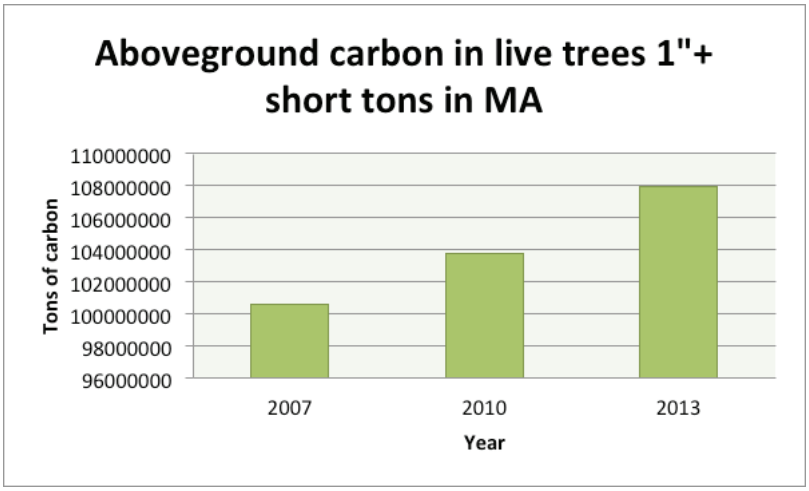
Carbon in Massachusetts' Forest

It is well known that trees and forests are an important element of the Earth's carbon equation. Science has shown that carbon dioxide levels are increasing, in part due to emissions associated with human use of fossil fuels in industry and transportation. Most scientists believe that this increase in carbon dioxide and other "greenhouse gases" is the key reason why planetary temperatures, on average, are on the rise. Forests naturally take carbon dioxide out of the atmosphere by the process of photosynthesis, and the by-product emitted to the atmosphere is the oxygen that we breathe.

The result of this natural phenomenon is that as forests grow, and if their inventory of wood increases over time, they act as a positive carbon sink where atmospheric carbon dioxide is sequestered as carbon in the wood of the tree. Forests with increasing volumes and carbon mass can provide a positive benefit in the greenhouse gas equation.

According to FIA data, the carbon in the above-ground portion of trees one-inch in diameter or more has increased in Massachusetts over 7% from 2007 to 2013.

Figure 8



Source: USDA Forest Service, Forest Inventory and Analysis

Forest Health

The effects of climate change on the forests of Massachusetts remain uncertain. This phenomenon may even increase forest growth, but we simply do not know enough to suggest long-term effects on the trees directly from climate change. There are other significant factors affecting forest health including insect pests and competition from non-native invasive species.

Asian longhorned beetle Photo: USDA

The three insects of greatest concern today are hemlock woolly adelgid, emerald ash borer and Asian longhorned beetle. At the moment, the Asian longhorned beetle has officially been eradicated from the Boston, MA area and is still in the Worcester area and heroic efforts, at great cost, have been employed to eradicate it. Hemlock woolly adelgid and emerald ash borer are found in Massachusetts, but fortunately, only affect ash species and hemlock. No big losses have occurred yet in Massachusetts, but hemlock wooly adelgid is being found throughout the state and emerald ash borer was first found in the state in 2012 and is likely spreading. The entire state is now under a USDA quarantine to limit movement of the pest to uninfected areas outside the state.

Lastly, invasive plants, such as autumn olive, buckthorn, Japanese knotweed, bittersweet and garlic mustard, among others, all appear to be growing in area and reach. As these invaders become more established, forest trees are being affected and in some cases are crowded out by these invasive plants. Climate change and related temperature increases may stimulate growth of valuable trees but it also allows invasive plants to get established and grow faster as well.

IV. Forest-Based Economy – current status and trends

The forest-based economy of Massachusetts, one of the oldest industry sectors in the State, includes forest products and forest-based recreation.

Forest products manufacturing includes the forestry, logging, and trucking components in which management, harvesting, and transportation move the raw material from the forest to various markets for processing. From there, primary products are manufactured into solid wood products in sawmills, out-of-state veneer mills, and engineered wood product mills such as oriented strand board plants or particle board manufacturers though neither of these industries is found in Massachusetts at this time. These primary products are then used by secondary manufacturers in making finished goods such as furniture, moldings, and turned wood products. Although there are no longer wood pulp mills in Massachusetts, there are paper manufacturing plants that obtain pulp material from out-of-state pulp mills – some of which are in the northeast U.S. region. Some of the timber harvested in Massachusetts' forests goes to these pulp mills.

Lastly, the growing wood energy sector includes large wood-fired power plants, medium to small sized commercial facilities using wood chips or pellets to create heat and/or electricity, and, at the residential level, homeowners that heat their homes with firewood or wood pellets. Wood from Massachusetts trees provides raw material for this growing sector in the region.

Forest-based recreation is a large and growing part of the economy throughout the northeast. Hundreds of thousands of people enjoy Massachusetts' forests for camping, hiking, hunting, downhill skiing, cross-country skiing, snowmobiling, wildlife viewing, and fall foliage viewing.

It must be noted that some of the data included in the next sections are from 2014 but most are from 2013 or 2012. Activity and output in the forest products manufacturing sector has seen a big upturn in 2013-14 as the country comes out of the recession and the economy recovers. The data below does not necessarily show this.

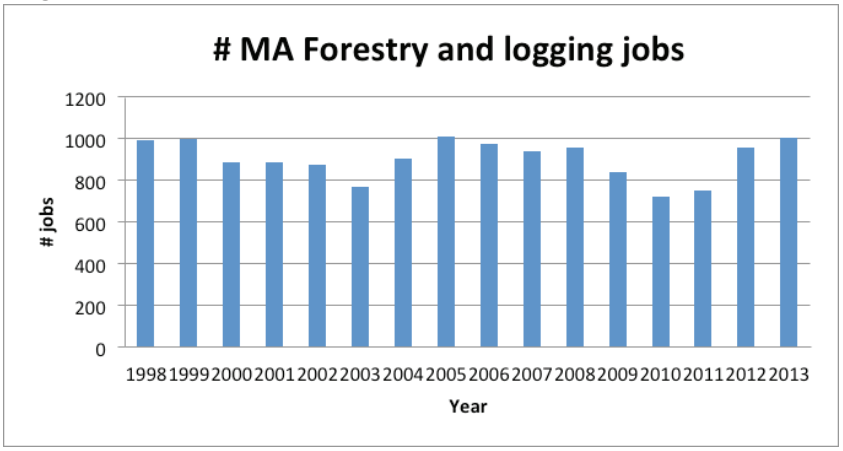
Forestry and logging

The forestry and logging sectors of the economy move logs, pulpwood, firewood, or chips from the forest to their primary manufacturing market. Employment in this sector is estimated at 1003 jobs, about as high as it has been in recent years (see Figure 9). Payroll for forestry and logging in Massachusetts exceeds $24.5 million annually (Figure 10) and has stayed level since 2011.

The Gross Output (sales) of the forestry and logging sectors in Massachusetts is approximately $ 62 million (Figure 11).

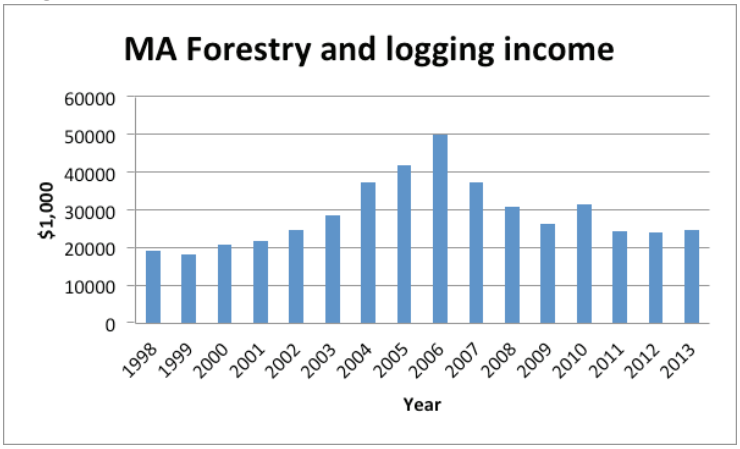
GDP – Gross Domestic Product includes value added, which is equal to its gross output minus its intermediate purchases from domestic industries or from foreign sources.

Figure 9



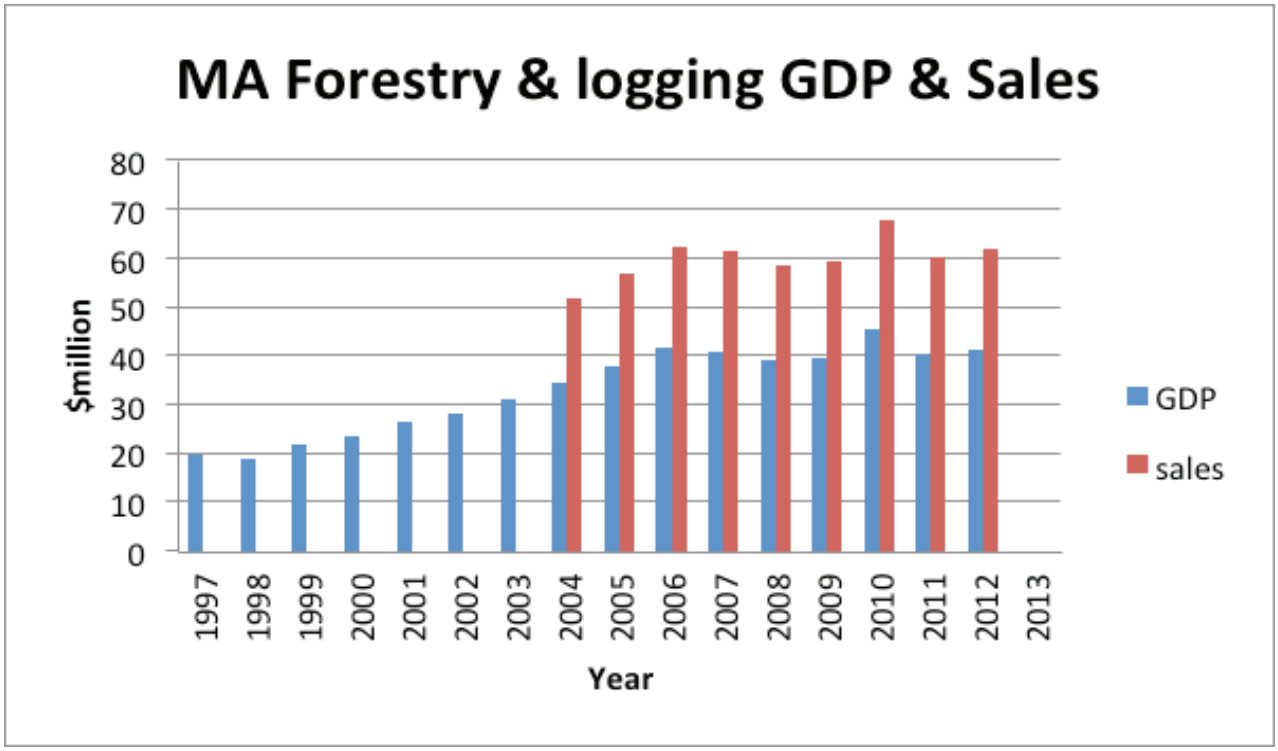
Source: U.S. Department of Commerce – Bureau of Economic Analysis

Figure 10

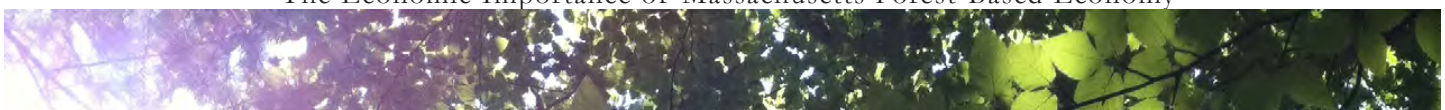


Source: U.S. Department of Commerce – Bureau of Economic Analysis

Figure 11



Source: U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures

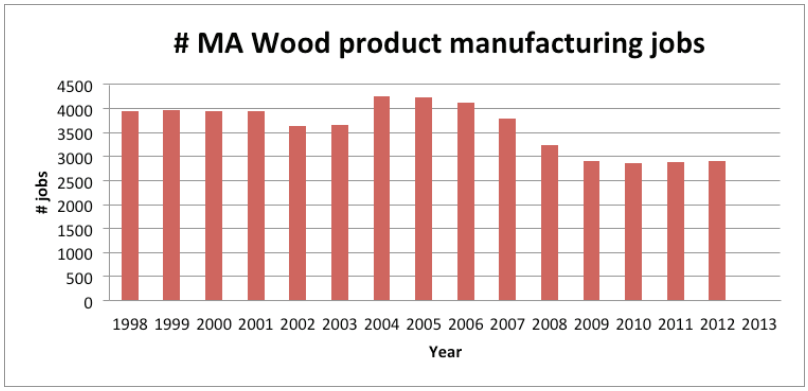


Primary manufacturing – wood products

Makers of lumber and related activities employ 2,900 workers, which is down from a high of approximately 4,200 in the year 2004. Worker productivity has been increasing in this sector as mills automate and institute better manufacturing processes.

Lastly, annual economic output, in the form of sales for the wood products sector is approximately $ 452 million in Massachusetts.

Figure 12



Source: U.S. Dept. of Commerce – Bureau of Economic Analysis

Figure 13

Source: U.S. Dept. of Commerce – Bureau of Economic Analysis

Payroll in the wood products sector is approximately $ 100 million annually. As seen in Figure 13, payroll has decreased since a high of $ 140 million in 2006.

This sector peaked in recent years with sales of nearly $ 768 million in 2006.

Figure 14

Source: U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures

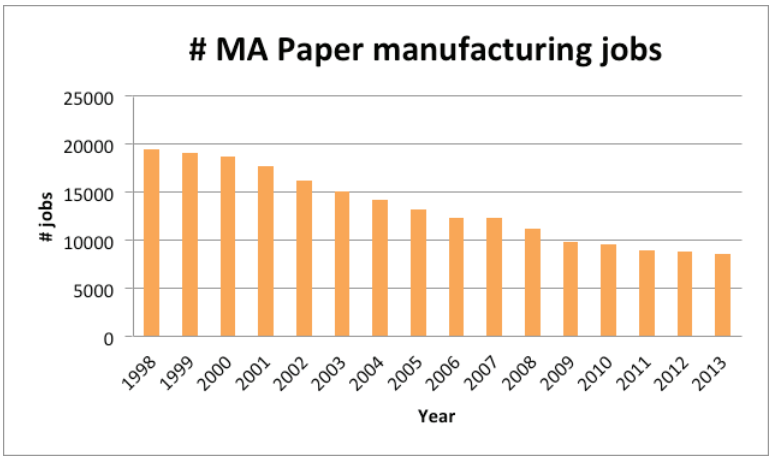
Pulp and paper

Massachusetts has no pulp mills but it has paper manufacturing facilities that use pulp as raw material from pulp mills in the region (and elsewhere). As a result, we believe there is a sufficiently direct connection with forests and forestry in the state to include economic information here. The paper making facilities in Massachusetts employ over 8,500 workers (Figure 15), down from approximately 19,000 in 1998. Payroll in the paper sector is approximately $ 545 million annually. Payroll has decreased since a high of $838 million in 2000.

While there are no pulp mills in Massachusetts, the logging infrastructure annually still harvests pulpwood for pulp mills in New York, Pennsylvania and Maine.

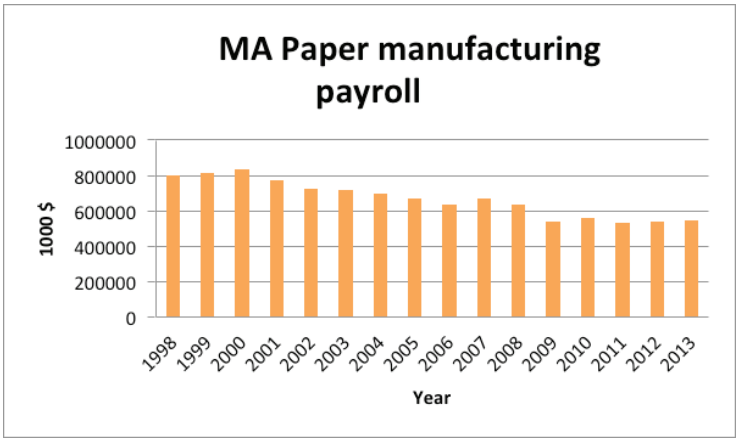
Annual economic output for this sector, in the form of sales, is approximately $ 1.57 billion in Massachusetts (Figure 17).

Figure 15



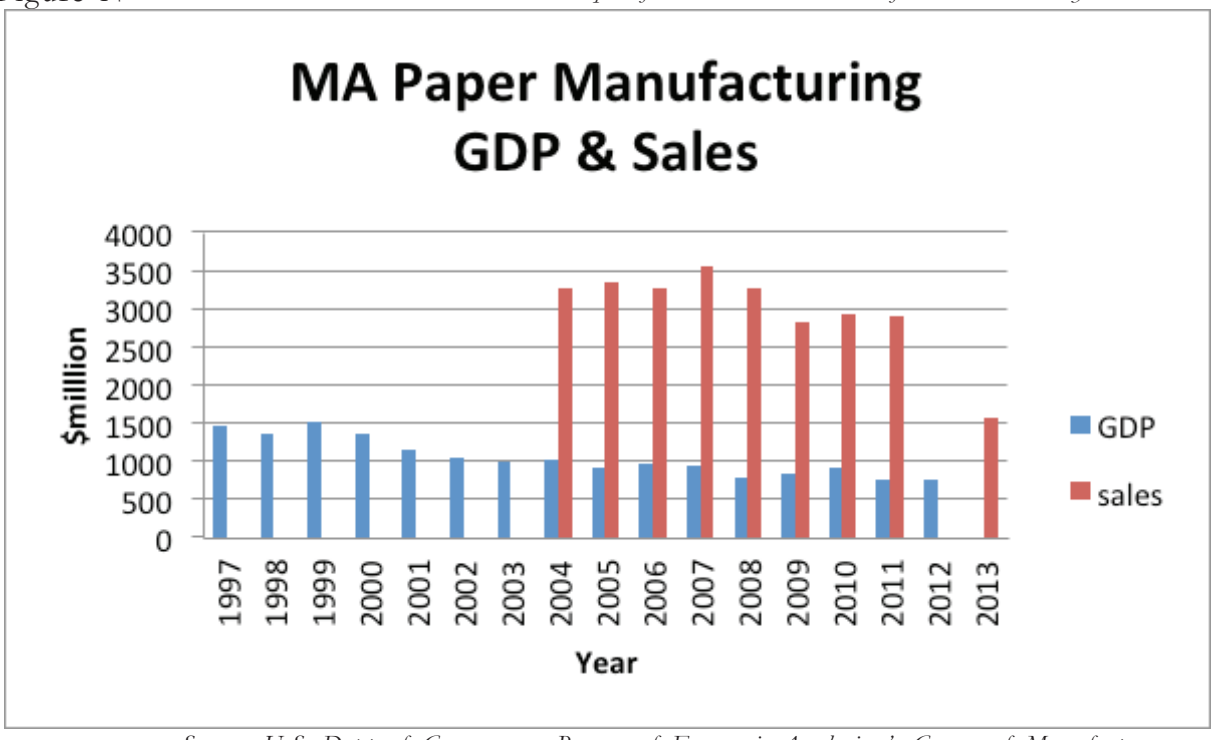
Source: U.S. Dept. of Commerce – Bureau of Economic Analysis

Figure 16

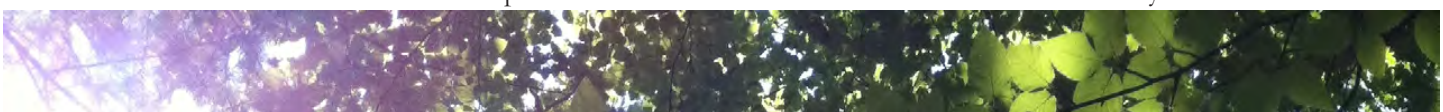


Source: U.S. Dept. of Commerce – Bureau of Economic Analysis & Massachusetts Department of Labor

Figure 17



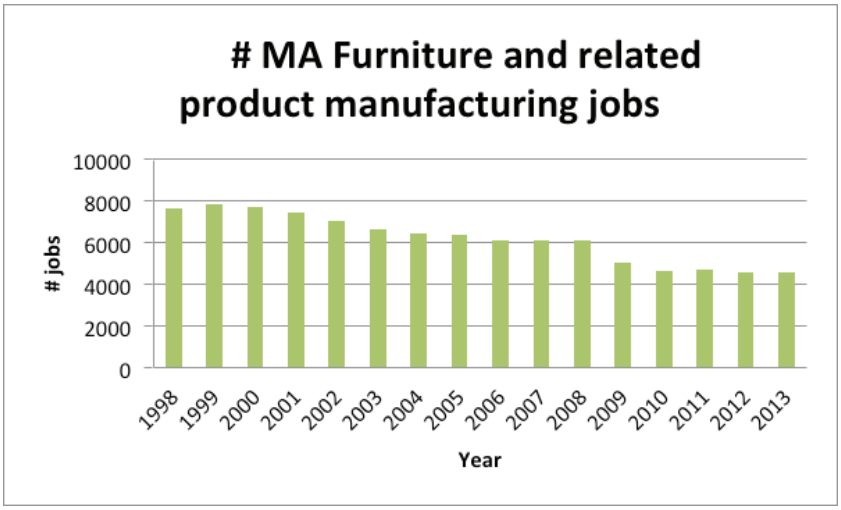
Source: U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures



Secondary manufacturing (furniture and related) – wood products

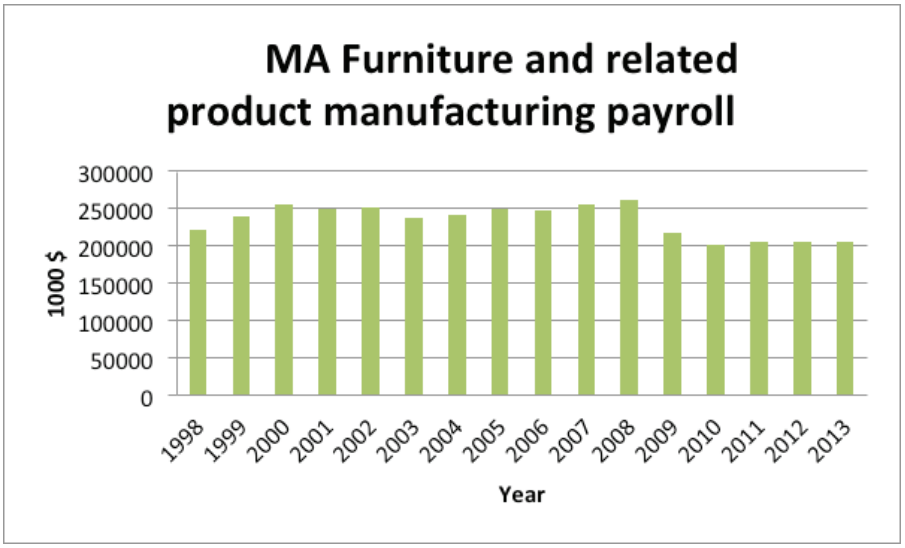
In the secondary wood products manufacturing sector – furniture, cabinetry, flooring, moldings, turnings and all production where the primary solid wood products are transformed into final or parts for final consumer products – Massachusetts employs over 4,600 (Figure 18), which is down from a high of approximately 7,800 in 1999. The secondary wood products sector payroll in Massachusetts is approximately $205 million annually. It has decreased since a high of $262 million in 2008 but has been steady in the last several years. Lastly, annual economic output, in the form of sales for the secondary wood products sector, is approximately $929 million in Massachusetts (Figure 20).

Figure 18



Source: U.S. Dept. of Commerce – Bureau of Economic Analysis

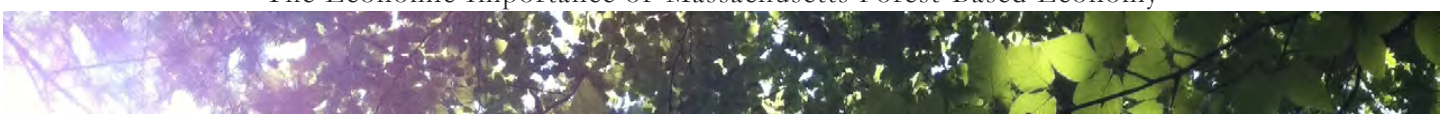
Figure 19



Source: U.S. Dept. of Commerce – Bureau of Economic Analysis & Massachusetts Department of Labor

Figure 20

Source: U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures



Wood Energy

Wood energy has gained increased attention at the national level and in the northeast in recent years. Many Massachusetts homes use wood as a primary or supplemental form of heating, and community-scale biomass applications, such as heating schools with wood boilers, have begun to take hold. Massachusetts has over 20 commercial/institutional building owners that use wood fuel as their heating source and more are exploring this option as an alternative to fossil heating fuels.

At the residential level, according to the U.S. Census Bureau's American Community Survey in 2012, Massachusetts experienced a 130% increase in the number of homes heating with wood as its main heating source from 2005-2012 (Figure 21). The survey indicated that over 43,814 homes, or 2%, use wood to heat – either firewood or pellets.

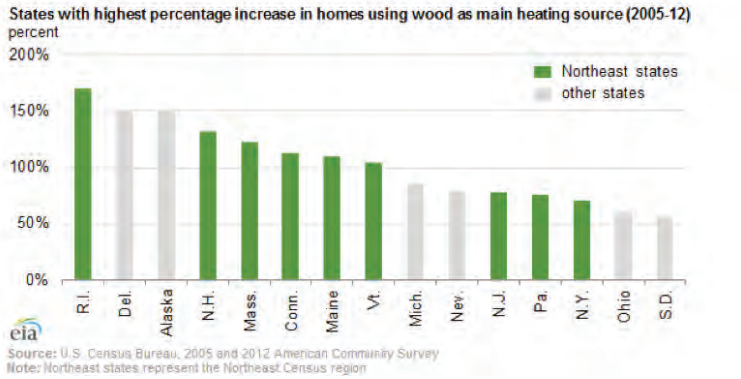
From state and other sources, annual wood fuel use – among residential, medium scale (businesses, schools etc) and large scale users – is estimated to be 150,000 cords each year in Massachusetts for heating and electricity generation purposes.

With respect to industrial scale wood energy, Massachusetts has an 18 megawatt large scale wood biomass fueled power plant in Fitchburg. It uses wood chips from tree tops and low quality trees as fuel.

Wood biomass is a locally sourced fuel, and - unlike most other energy sources used in Massachusetts – benefits the local economy through jobs in the harvesting, processing, and use of wood. Switching to biomass from fossil fuels often results in emissions reductions, depending upon the application and the fuel being replaced or offset. Biomass fuel is made from low-grade wood that is generally not suited for higher value markets and products. Markets for low-grade wood provide landowners and land managers options and opportunities for practicing forestry. . In many applications, biomass is cost competitive, and can provide consumers with an opportunity to save money, use a renewable fuel, and support the local economy. In today's economy, homeowners who switch from using fuel oil to wood pellets can save up to 25% on their heating fuel bill. When fuel oil prices were higher in 2013 (and likely to be again in the future), the savings were approximately 50%.

Figure 21

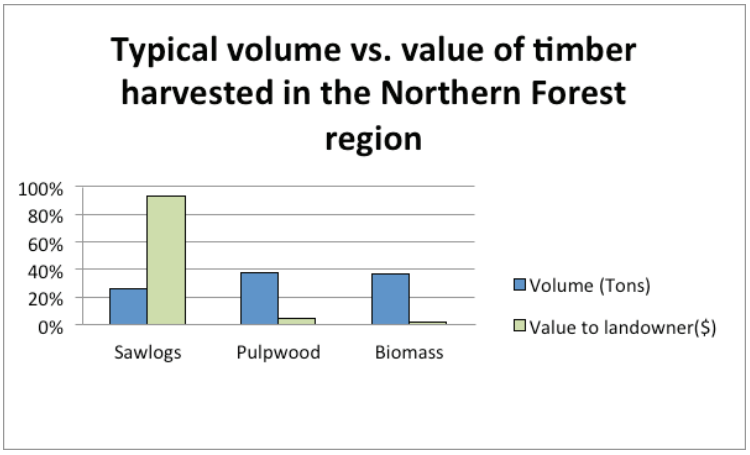
Increase in wood as main source of household heating most notable in the Northeast



People sometimes question whether wood use for energy can be sustainable in Massachusetts. Overall, as shown in Figure 6, Massachusetts is harvesting far less than the forest is growing, which allows for the inventory of trees to increase over time. The value to the forest landowner from harvesting trees for wood energy is very low relative to other products such as sawlogs that go to a mill to be processed into boards. Figure 22 shows that the economics of wood energy products make it unattractive for landowners to harvest only biomass since its value is too low. Today, a typical forest landowner in the northeastern U.S. will receive only $1-2 per ton of biomass chips harvested or $10-15 per cord of firewood. Nor do loggers profit much from selling biomass. A logging company most often harvests a full suite of products – from sawlogs to pulpwood to firewood and biomass chips – allowing them to cover their costs and make a small profit on the overall harvest. Typically, they cannot survive on harvesting biomass chips alone. Landowners harvest lower value products to improve the quality of the remaining trees in order to reap larger returns in the future when the higher value trees grow to maturity.

Regardless of the kind of harvest, loggers have adopted best management practices to protect water quality, and practitioners in Massachusetts are regulated to help ensure the sustainability of the harvesting of Massachusetts' forest lands.

Figure 22



Source: From typical harvest volumes and values in northeast U.S. states – state data

Most of the energy wood harvested in Massachusetts stays in Massachusetts or in the immediate region. The value of the wood, which is low relative to its volume and weight, usually makes it cost prohibitive to ship very far from where it is harvested. Some wood pellet mills in the southern U.S. are exporting pellets to Europe, but that is not occurring yet in the northeast U.S. and may not since there is strong local demand for pellets.

Christmas trees and maple syrup

The Christmas tree and maple syrup industries are small but well-recognized as important to the local economy in Massachusetts. In 2014, the wholesale and retail sale of maple syrup and related products in Massachusetts totaled over $ 2.7 million while Christmas tree sales were approximately $1.9 million. It is estimated that there are over 140 establishments in the maple syrup sector and another 70 in the Christmas tree sector in Massachusetts.

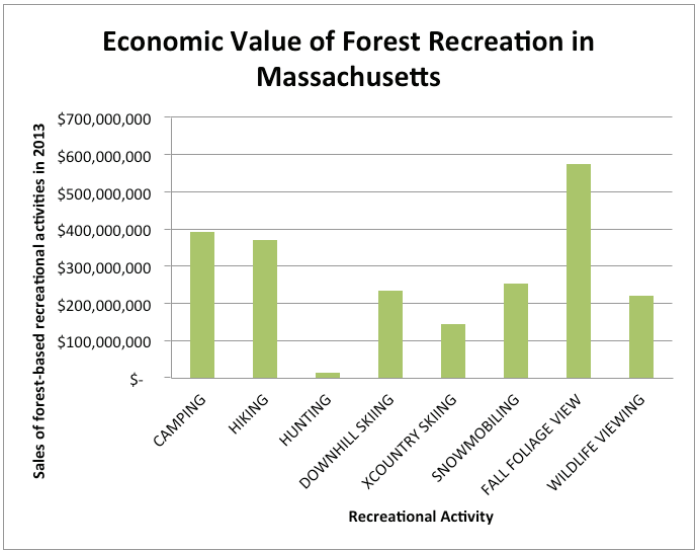
Conclusion on Forest Products Economy

The forest products trend data shown elsewhere in this report clearly show a smaller, more efficient forest products industry exists today compared to 15 or 20 years ago just as the other manufacturing sectors in our U.S. economy have changed during this period. Despite that, there is still a significant forest products economy in Massachusetts. During that time period and beyond, the volume of timber removals from Massachusetts's forest has fluctuated greatly but is about the same in 2013 as it was in 1952 – 25 million cubic feet. And the 2013 level is still part of the recession period (Figure 7).

Forest-based Recreation/ Tourism

Despite its high population density, forests dominate Massachusetts' landscape. Thus, a large percentage of recreation and tourism activities in Massachusetts are linked to the forest. Still, it is challenging to estimate the specific contribution made by the forest environment to recreation and tourism expenditures. Some activities take place primarily in the forest environment, including camping, hiking, hunting, downhill skiing, cross-country skiing, snowmobiling, fall foliage viewing, and wildlife viewing. In this analysis, we assume that 75% of the value of these activities is directly attributable to the existence of forests of Massachusetts. For fall foliage viewing, we assume a percentage of 100%. The method used for the forest recreation sector in the federal agency research used for this section (USDA Forest Service and U.S. Fish & Wildlife Service) is a multiplier-like approach so that a dollar spent on forest-based recreation in Massachusetts ripples through the economy of jobs and income to many support industries to recreation.

Figure 23



Sources: Multiple sources including National Survey on Recreation and the Environment from the USDA Forest Service and National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Analysis by Dr. Hugh Canham

The key data source for the economic value of forest recreation is the National Survey on Recreation and the Environment from the USDA Forest Service. Additionally, we have used results from the new National Survey of Fishing, Hunting, and Wildlife-Associated Recreation conducted most recently in 2011 by the U.S. Fish and Wildlife Service of the federal Department of Interior. These data have been updated to 2013 using the Consumer Price Index.

The forest-based recreational activities listed above contribute $ 2.2 billion in sales annually to the Massachusetts economy. These are distributed among purchases at food and beverage stores, service stations, lodging places, eating and drinking establishments, and a host of other retail trade or service sectors. Fall foliage viewing is the largest contributor with 25% of the total sales, and is followed by, in order, camping, hiking, wildlife viewing, snowmobiling and downhill skiing (Figure 23).

About 9,000 people are employed in forest-based recreation and tourism sectors with payrolls of $293 million annually.

Jobs and Annual Payroll – Massachusetts forest recreation economy

Jobs	payroll
9,000	$ 293,626,530

Value of Ecosystem Services

The purpose of this publication is to show the economic value of the forest-related economy in Massachusetts. The data provided shows those parts of the goods and services provided by Massachusetts' forests that can be measured and, generally, have a monetary value placed on it within the economy. Other goods and services from Massachusetts' forests are not so readily measured in dollars and cents, especially the natural assets sometimes referred to as "ecosystem services". Forest ecosystems are ecological life-support systems that provide a full suite of goods and services that are vital to human health and livelihood. They include wildlife habitat and biological diversity, clean air, clean water and watershed services, scenic landscapes, and carbon storage, which we discuss briefly but on which we did not place a monetary value.

Carbon in forests and, more accurately, a tree's ability to sequester carbon from carbon dioxide in the air into wood through photosynthesis is now taking on monetary value for some forest owners through the California greenhouse gas regulatory process. Prices being paid in 2013 range from $10 to $12 per ton of carbon sequestered but prices in this infant market can fluctuate widely. A rough average of carbon being sequestered in Massachusetts' forest that can be monetized in these new markets is likely between 0.5 ton and 1.5 tons of carbon per acre per year, depending on the age, forest type and stocking of the forest, among other factors. Though modest, it may be the start of converting valuable ecosystem services to market-based assets. Regardless, ecosystem services not yet monetized should be considered a valuable part of the forest-based economy in Massachusetts.

Massachusetts Department of Conservation and Recreation

The Massachusetts Department of Conservation and Recreation, where the state Forestry agency resides, can be reached at 617-626-1250.

Programs within Forestry in the Department of Conservation and Recreation support the highest standards for forest management on the state's more than two million acres of private forest land by funding forest stewardship plans for interested private landowners. Through an extensive outreach effort, DCR's Forest Stewardship Program has sent educational materials to nearly 15,000 landowners who collectively own 685,000 acres or 1/3 of the state's private forest land. Over the past three and one half years, this project has completed 760 forest stewardship plans on more than 51,000 acres of forests. Each plan is completed by a private professional forester who works closely with the landowner to meet the landowner's goals by utilizing sustainable forest management practices. Landowners commit to implement these plans and keep their land in forest cover for a 10 year period. At a cost to the state of about $17 per acre, this is an excellent tool to help conserve forest land and increase sustainable forest management.

The National Association of State Foresters, a non-profit organization that is made up of the individuals who head the state forestry agencies in the U.S, periodically reviews information about the state agencies that oversee forestry in their respective state. The most recent report on this topic is "NASF State Forestry Statistics Benchmarks - Fiscal Year 2012" and can be found at http://www.stateforesters.org website under publications.

Issues with potential to affect the future forest-based economy in Massachusetts

There are a number of issues that could affect the future forest-based economy in Massachusetts.

- Land removed from active management – If significant acreages of forestland are removed from the working forest, those acres may still provide the backdrop for the forest recreation/tourism part of the economy but will no longer also provide the raw material for the forest products manufacturing sectors of the economy. This can also occur when forest land is fragmented by development.
- Climate change – In the short-term, slightly longer growing seasons resulting from shortened winters and slightly warmer temperatures, given all other things being equal, may increase the growth of Massachusetts's trees and provide for slightly longer warm weather periods each year for recreation in the woods. Shortened winters may have negative effects on that portion of the recreation economy. This phenomenon may benefit parts of the forest-based economy. Should climate change also result in increased forest pest problems and reduce overall annual rainfall (or result in other changes), the perceived benefits could be offset. Over the long-term, any positive effects from climate change could disappear should temperature increases and climate changes not modify over time.
- Loss of markets – For the forest products sector from the woods to the mill, robust market opportunities are extremely important. The trend data shown in this report depicts a smaller overall forest products manufacturing industry than 20 years ago with trends suggesting continued contraction. The positive sign is that the industry is producing more product per worker than ever before and diversifying markets which are located within and near Massachusetts in the northeast region. The wood energy sector continues to grow, particularly for thermal installations in homes, schools etc.
- Loss of tree species – As with the changes brought on in the forest economy when american chestnut dropped out of the forest due to the chestnut blight in the 20th century, new pathogens and invasives may do the same for species like ash and hemlock, with unknown effects.
- Reduced federal and state support for forestry assistance programs – Certain forest activities, chiefly forest management by the tens of thousands of private forest owners in Massachusetts, have been subsidized, in part, by the federal government in the form of cost-share payments for management plans and a variety of forest management activities. The Massachusetts Department of Conservation and Recreation staffing levels are also being affected by state budget issues as with other sectors. It is expected, in these times of reducing federal budgets in discretionary spending, that cost-share opportunities for forest stewardship will dwindle, resulting in less forest improvement work on the ground for that subset of the forest owner population that has taken advantage of the financial assistance.
- Federal and state tax and other policies – Business owners in the forest products and forest recreation sectors in Massachusetts have long said that stable public policies are important for business. Changing policies, however well-meaning they might be, make for a challenging business environment.
- Cost of travel – A large portion of the forest-based recreation economy in Massachusetts is based on individuals traveling from other locations and within to visit Massachusetts and enjoy the beauty of this heavily forested state. The price of transportation fuels is a key factor in whether tourists decide to travel to Massachusetts. Recent drops in transportation fuels will have positive effects on forest recreation spending. As transportation fuels increase in the future – as they no doubt will, recreation in the forest, at least for visitors from elsewhere, may be reduced.

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This booklet is part of a series on the economic importance and value of forest-based manufacturing and forest-related recreation and tourism sectors in the northeastern states of Maine, New Hampshire, Vermont, New York, Massachusetts, Connecticut and Rhode Island produced by the North East *State* Foresters Association (NEFA). Past reports can be viewed at www.nefainfo.org.

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