



The
**ECONOMIC
IMPORTANCE
of
MAINE'S
FOREST-BASED
ECONOMY 2013**

North East *State* Foresters Association



I. Introduction

We are pleased to again update information on Maine's forest resources and forest products manufacturing activities.

Like similar forested states, Maine had a downturn in harvesting and manufacturing over the past decade. While efficiencies were realized, as shown in productivity rates, fewer jobs were available as a result. The necessity to retain a competitive position in outside markets requires considerable adjustments in the labor force and capital structure.

Maine is unique in many ways from its competition. The state's proximity to deep water coastal ports, the eastern seaboard's consumptive population, transportation infrastructure, large private holdings, entrepreneurial experience, research capability, Canadian provinces and sister states, provides opportunities to rebound from market retrenchments. Very few states have such a list of positive influences.

The somewhat erratic but building international demand for fuel wood seems likely to comprise a significant component of Maine's future fiber exports. Composite and biofuels research at the University of Maine campus will help keep Maine ahead of developing product markets.

Maine's forests have a structure, species composition and health that will support future manufacturing growth. Of course, Maine has several pests that pose threats to future wood supplies but, mitigation measures are constantly being explored and implemented.

Maine's geographical position has led to productive import/export opportunities for both landowners and manufacturers. The extensive import/export market takes advantages of both U.S. and Canadian areas of marketing and manufacturing expertise. Maine's entrepreneurial know-how and manufacturing base has helped adjacent states process their excess growth.

Hopefully, the next publication of this report will show Maine consuming its growth at more recent and higher sustainable levels and that looming pest challenges have been met and eradicated.



Doug Denico, State Forester Maine Forest Service

Doug Denico, State Forester
Maine Forest Service
Fall, 2013

Acknowledgements: Funding for this report was provided by the State of Maine, and the U.S. Endowment for Forestry and Communities through the Northern Forest Center.

This report is an update of a series of similar reports that have been published for the State of Maine by the North East State Foresters Association since the early 1990s. The goal 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. Additional discussions in this report, compared to past reports, include use of economic multipliers to give a truer picture of the forest-based economy, carbon content of the forests of Maine and the relationship of ecosystem services to the forest-based economy.

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

We would like to thank the many people who assisted with the development of this report including Doug Denico, Don Mansius and Ken Laustsen of the Maine Forest Service and Joe Short and Rob Riley of the Northern Forest Center.



II. Executive Summary

- Forest area and species – **Maine’s forests cover 17,638,063 acres** of land and have largely remained at this level since the 1980s. **Northern hardwood (beech, birch, maple) and spruce-fir forests make up over 75%** of the forest cover.
- Forest ownership – Maine’s forests continue to be largely privately owned by **individuals/families and business who together own over 93% of the forest.**
- Forest inventory, growth vs. harvest – The forests of Maine continue to add to the inventory of tree volume as net growth exceeds harvest annually. Currently, **Maine’s forests grow 9.65 million cords per year while approximately 7.86 million cords of timber is harvested annually.** Maine’s standing forest contains 26.0 billion cubic feet of timber 5 inches in diameter or larger or approximately 325 million cords.
- Value of forest industry economic sectors – The annual value of sales or output of **Maine’s forest products industry totals over \$5.4 billion while the forest-based recreation economy is worth \$2.8 billion.** Approximately **19,433* workers are employed in the forest products, maple syrup and Christmas tree sectors,** while another **19,800 jobs are found in the sectors that include and support the forest recreation economy.**

Table 1.
Gross Output, Forest-based Manufacturing & Recreation, Maine, 2011

	millions of	jobs*
Forestry, logging & trucking	\$240	5,200
Wood products manufacturing	\$797	5,000
Furniture and related product manufacturing	\$171	1,480
Paper manufacturing	\$4,000	7,300
Wood energy	\$209	325
Christmas trees and maple syrup	\$16	128
Sub-total direct	\$5,433	19,433
Sub-total multipliers	\$2,542	19,347
Sub-total with multipliers	\$7,975	38,780
Forest Recreation	\$2,800	19,800
Total	\$10,775	58,580
GSP, Forest Products Manufacturing	\$1,723	
GSP, All Manufacturing, Maine	\$5,497	
GSP, Total for Maine	\$53,656	

*full-time equivalent jobs

Gross Output – Includes the total value of all products produced and shipped by all producers (essentially sales).

- **Using multipliers** generated through IMPLAN, an economic model, **it is estimated that the forest products sector has \$8 billion in economic output and 38,780 jobs** when taking into account the ripple effect this industry has on other parts of the economy.
- **Economic output and number of jobs in the forest products sector have declined since peaks in the 1990s and early 2000s.** This mirrors similar trends in other manufacturing sectors in the U.S., as more and more manufacturing has become more automated and/or moved to other parts of the world.
- While most of the wood harvested in Maine is processed in Maine, wood flows freely in the regional economy. In 2011, **5.617 million cords of wood were harvested in Maine, 5.995 million cords were processed in Maine while 860,000 cords were exported, mostly to Canada and 1.238 million cords were imported.**



III. The Forest Resource

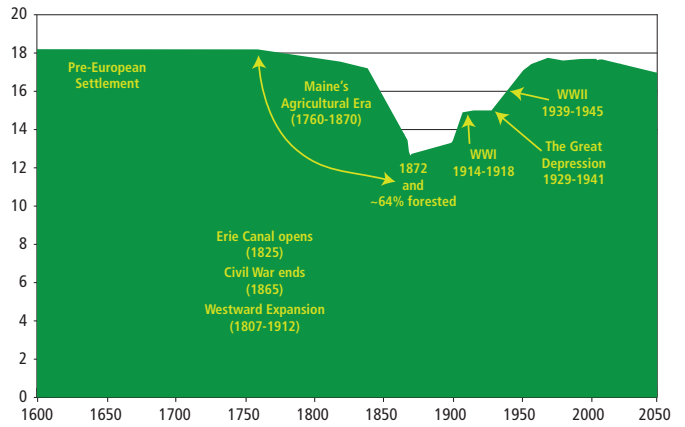
Forest Area

Maine has a higher percentage of forest cover than any other state in the U.S. Currently nearly 89% of Maine is forested. Of the 17,638,063 forested acres in Maine, 17,176,034 acres are considered “timberland,” meaning these lands are capable of producing repeated timber crops.

The USDA Forest Service’s Forest Inventory and Analysis data from 2007 to 2012 estimates a net gain of 63,000 acres into non-forested uses over this 5-year period.

Long-term forestland acreage estimates show that Maine’s forested area is only somewhat less from the original European settlements in 1600 (See Figure 1). It estimated that in 1600 forests covered 18.2 million acres compared to today’s 17.6 million. The Pine Tree State’s forests have grown back after reaching a low of 12.6 million acres in 1871.

Figure 1
Estimate of Maine’s Forestland

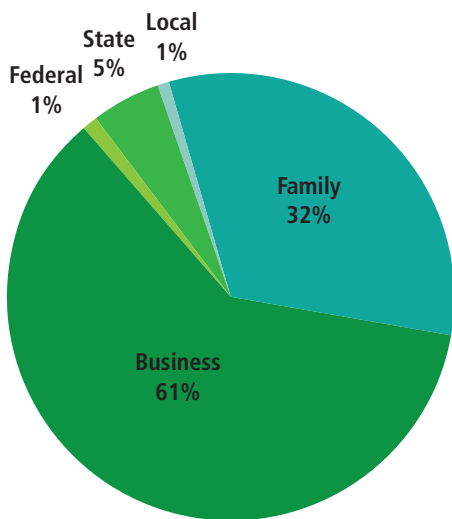


Source: Maine Forest Service, multiple sources

Forest Ownership

The private sector continues to dominate the ownership of Maine’s forest. Fully 93% of Maine’s forests, or 16.2 million acres, are owned by either businesses or families (Figure 2). The State of Maine owns 5% or approximately 902,000 acres of Maine’s forests, and local communities own 205,000 acres and the federal government 186,000 acres, respectively.

Figure 2
Maine Timberland Ownership

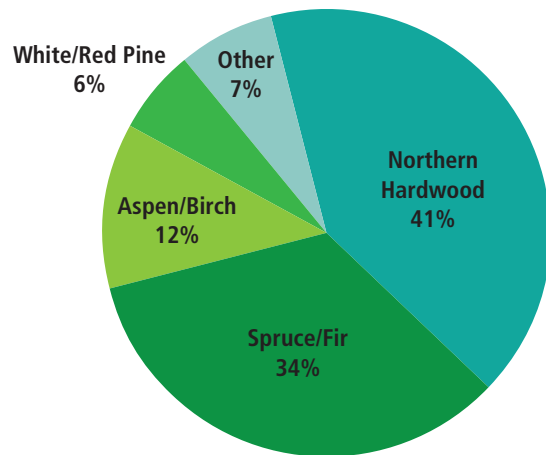


Source: USDA Forest Service, Forest Inventory and Analysis & private data

Forest Types

Maine’s forests are dominated by northern hardwood and spruce-fir types. More than 7.2 million acres of northern hardwood and 6.0 million acres of spruce-fir types can be found in the Maine woods. Aspen/birch and white-red pine (mostly white pine types) cover 2.1 and 1.1 million acres respectively.

Figure 3
Maine Forest Types



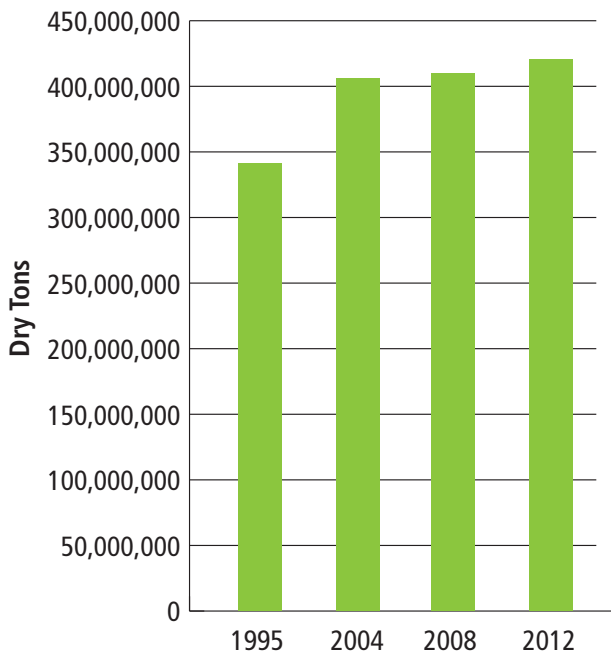
Source: USDA Forest Service, Forest Inventory and Analysis



Timber Volumes

To understand the volume of wood growing in the forests of Maine, it is most useful to look at inventory trends over time rather than just current static volumes. Growth, mortality and harvest levels determine the overall changes over time. Figure 4 shows that standing volume of timber in Maine increased over 23% from 1995 to 2012. Standing volume is nearly 419 million dry tons of wood in trees 5 inches and larger.

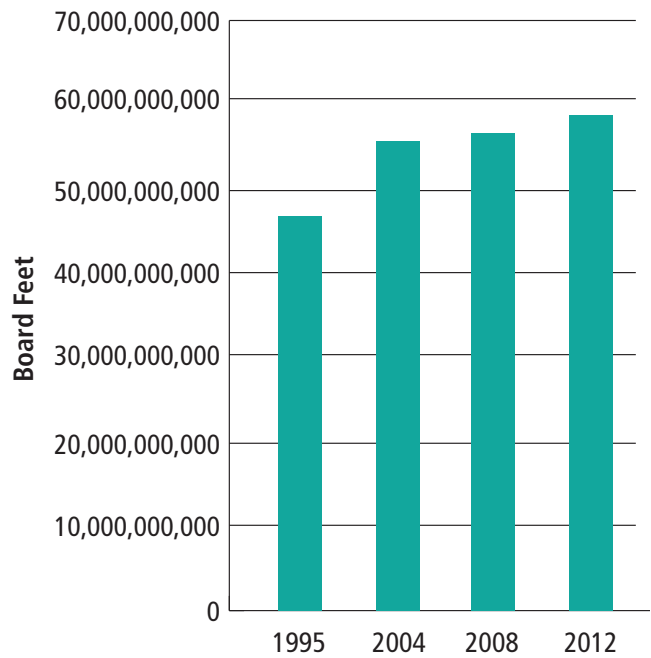
Figure 4
Biomass on Timberland - dry weight of merchantable boles 5" and up - Maine



Source: USDA Forest Service, Forest Inventory and Analysis

From a timber value perspective, it is important to know what is occurring over time with the sawtimber component of the timber inventory in Maine since sawtimber products are generally much more valuable to the landowner than lower quality products (pulpwood, firewood and energy chips). In Figure 5, we see that the volume of sawtimber trees also increased from 1995-2012, in this case, by over 25%.

Figure 5
Net Volume of sawtimber in board feet, 1/4 inch rule - Maine



Source: USDA Forest Service, Forest Inventory and Analysis



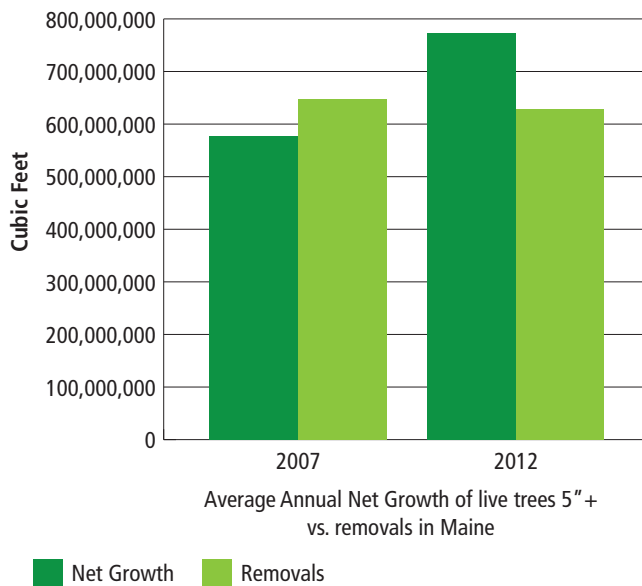
Sustainability - Growth, Mortality and Removals from Maine's Forests

Maine's forest inventory, in terms of volume and value, is increasing over time. To understand this better, we need to look at growth, mortality and tree removals. The USDA Forest Service's Forest Inventory and Analysis (FIA), where much of the data discussed so far in this report is derived, is also 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 over time, roughly every five years. Each on-the-ground plot represents approximately six thousand acres and has been providing forest data for over 50 years.

In Figure 6 below, the current FIA data shows that, statewide in Maine, annual net growth¹ in Maine's forests is 772.1 million cubic feet per year. At the same time, approximately 628.6 million cubic feet of timber is harvested annually. The difference between the net growth and harvests - 143.5 million cubic feet - is the annual extra growth that accounts for the increasing inventory of trees in Maine.

This also holds true in both the northern (North Woods) six counties and the southern 10 counties in Maine. Figure 6a shows a similar pattern looking at north versus south in Maine.

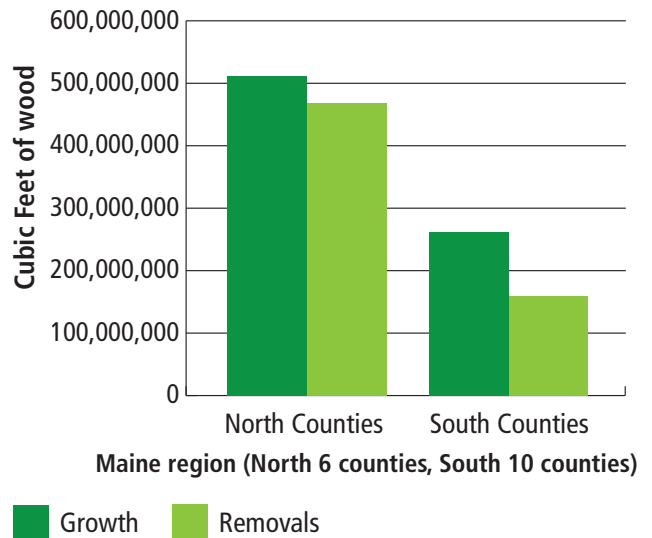
Figure 6
Net timber growth vs. removals in Maine's forest



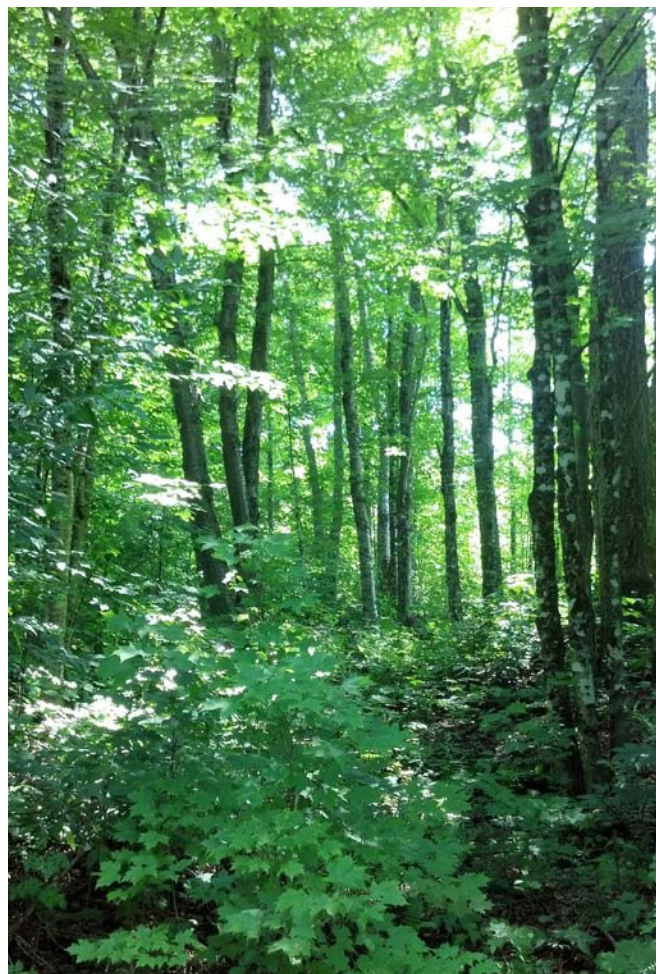
Source: USDA Forest Service, Forest Inventory and Analysis

1. Net growth means the gross growth of the trees in the forest less the mortality of trees

Figure 6a
Maine timber growth vs. removals 2012, North & South



Source: USDA Forest Service, Forest Inventory and Analysis



The difference between forest net growth and harvest is a key measurement for understanding the sustainability of Maine's forests. Other aspects of forest management, including the following, further add to understanding the status of forest sustainability in Maine:

- a. **Certified forestland** – Maine is one of the leaders in the U.S. in acres of certified lands under the American Tree Farm System, Forest Stewardship Council and Sustainable Forestry Initiative. Nearly 59% of Maine's forests are certified through one of the systems listed. In addition to the sustainable harvest levels discussed above, these voluntary standards 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. Maine, along with virtually all forested states in the country, has had in place for many years voluntary Best Management Practices for Water Quality Protection, commonly called BMPs. The three certification programs all require use of BMPs and, more importantly, use of BMPs on forestry operations has become integrated into most forest operations in the last 10 or more years. 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. Maine has done field sampling to understand how BMPs are being implemented on harvests. The Maine Forest Service has been field monitoring BMP implementation since 2000. The most recent work from 2011 showed that BMP implementation has prevented water quality problems on forestry operation on 90% of the sites sampled, an increase from 83% in the previous survey.
- c. **Use of professional foresters and loggers** – The use of licensed foresters and certified loggers is key to assuring well-managed harvesting operations, whether lands are certified or not. According to the Maine Forest Service, in 2011, 39% of all harvest operations and 73% of all harvest acres were under the supervision of a licensed forester. Licensed foresters are involved on the vast majority of investor-owned and forest industry lands. A high percentage of loggers operating in Maine are certified through the voluntary Certified Logging Professional program.

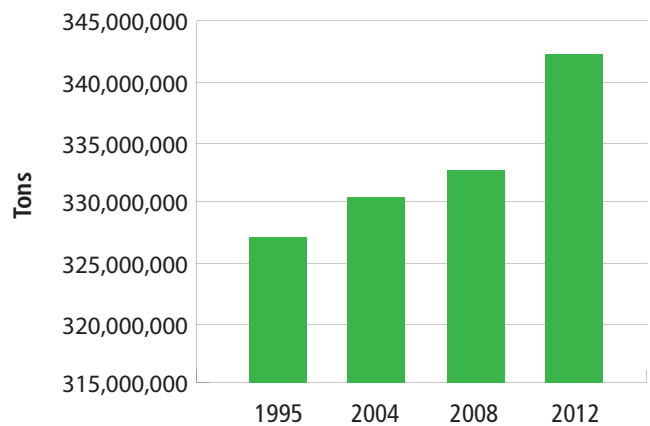
Carbon in Maine's Forest

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, likely in large part due to emissions associated with human 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 in their normal practice 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 positive carbon sinks where atmospheric carbon dioxide is turned into 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 Maine nearly 5% from 2004 to 2012.

Figure 7
Aboveground carbon in live trees 1"+



Source: USDA Forest Service, Forest Inventory and Analysis



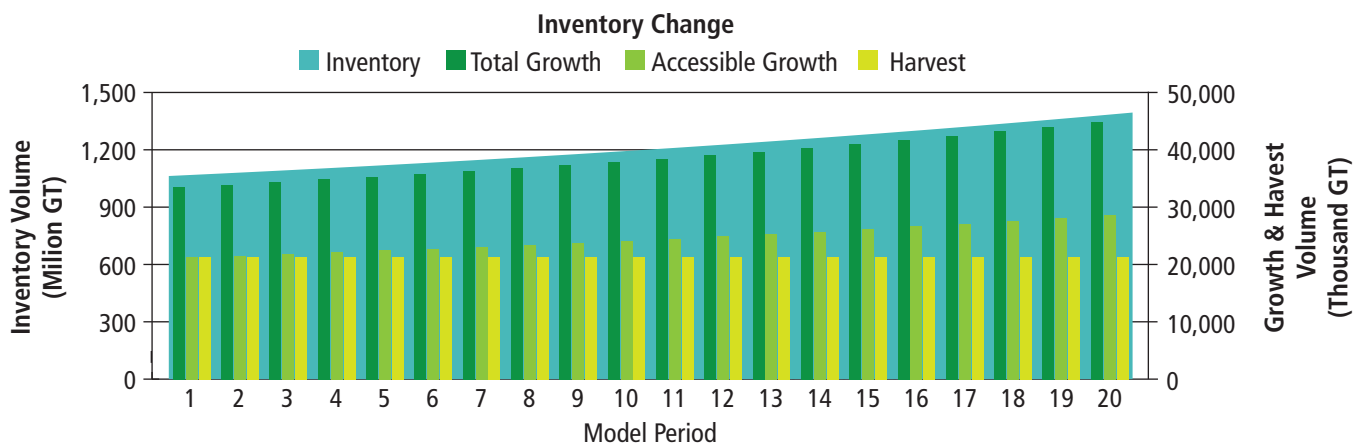
Maine's Forest Projections

Using the Northern Forest Biomass Project Evaluator² tool developed by the North East State Foresters Association through a grant provided by the USDA Forest Service, we are able to take a look at a possible future inventory of the forests of Maine. The evaluator provides a computer model of growth based on input of a number of variable factors. Figure 8 shows a likely 20 year future projection of the forest resource in Maine based on assumptions that harvest levels stay constant, timberland acreage is reduced slightly over time and the growth rate is reduced slightly over time.

In this likely future, the total growth and accessible growth increases and the total inventory increases from 1.062 billion tons of standing forest at the beginning of the period to nearly 1.4 billion tons at year 20 including all live woody biomass. This represents a 22% increase in standing volume of the forests of Maine, across all ownerships and acreages.

Figure 8
Northern Forest Biomass Project Evaluator – A steady state run for Maine for 2013-2032

Inventory totals are for all live, above-ground biomass on timberland.



2. Go to www.nefainfo.org to obtain a working version of the model for your own use.



FOREST HEALTH

Though forest health is not a focus of this paper, it impinges on productivity and sustainability, and impacts the dependent economy. Both native and exotic insects and diseases have influenced the condition of Maine's current forest resource – and they continue to do so. Past outbreaks of the native spruce budworm and establishment of exotic pests such as white pine blister rust and beech bark disease are compelling representative examples of past pest events and resultant impacts. And there are other serious exotic pests that are already established in the region, if not yet in Maine.

Confounding these situations, the effects of climate change on the forests of Maine remain uncertain. This phenomenon may even increase forest growth, and we simply do not know enough to suggest long-term effects on the trees directly from climate change. We do know, however, that climate change is apparently influencing dynamics of some pest populations, which are already affecting our forests. The best known example of climate exacerbated impacts is probably hemlock woolly adelgid (HWA). No big losses have occurred yet in Maine, but HWA is now found across in southern-most and south-coastal sections of the state, and decline of forest hemlock stands is beginning to accrue. With continued mild winters we can expect the expansion and intensification to continue. This same pattern of intensification and expansion is true for elongate hemlock scale and balsam woolly adelgid. Although less well recognized by the public, there are diseases such as red pine shoot blight and white pine needlecast, whose intensification and impacts have appear to be exacerbated by the wetter spring weather. The current influence is recognizable, we can expect the future impacts to be significant.

Lastly, invasive plants, such as autumn olive, buckthorn, Japanese knotweed and Japanese barberry all appear to be growing in area and reach. As they become more established, forest trees will be affected and in some cases crowded out. Climate change may stimulate growth of valuable trees but it also allows invasive plants to get established and grow faster as well.

Beyond the climate exacerbated pests, there is also well justified concern about an impending spruce budworm outbreak. The last outbreak in the late 1970s resulted in the mortality of vast acreages of spruce-fir forests. The current outbreak in Quebec continues to intensify and expand. Defoliation is now apparent on the south shore of the St. Lawrence. If/when this outbreak expands into Maine, it will have significant effects in the very spruce-fir forests that regenerated beginning in the late 1970s and 80s following the last outbreak.

IV. Forest-Based Economy – current status and trends

Maine's robust forest-based economy includes harvesting forest products and non-consumptive uses of the woods. It is one of the oldest sectors of the state's economy.

On the wood forest products side of the equation, it starts in the forest and 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 in many subsectors, including solid wood products from sawmills, veneer mills, and reconstituted wood chip mills such as oriented strand board plants or particle board manufacturers. These primary products are then used by secondary manufacturers in making finished goods such as furniture, moldings, and turned wood products. Pulp and paper manufacturing facilities are both primary and secondary manufacturers. Lastly, the growing wood energy sector is found at large wood-fired power plants, medium to small sized commercial facilities using woody biomass to create heat and/or electricity and at the residential level where homeowners heat their homes with firewood or wood pellets.

On the non-consumptive side, forest-based recreation is a large and growing part of the economy. Thousands of people visit Maine's 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 2012 but most are from 2011. Activity and output in the forest products manufacturing sector has seen a big upturn in 2013 as the country comes out of the recession. The data below do not show this.



Forestry, logging, and trucking

The forestry, logging, and primary trucking sectors of the economy do one thing – get the logs, pulpwood, firewood, and chips from the forest to their primary manufacturing market. Employment in this sector is estimated at 5,200 jobs, down from a high of 6,300 in 2002 (see Figure 9). Payroll for forestry and logging in Maine exceeds \$240 million annually (Figure 10) and has largely trended upward since 1990.

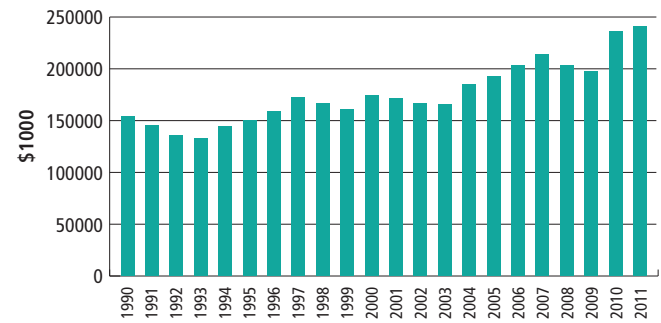
The annual economic activity for forestry trucking, found in the form of annual sales or value of shipments, is over \$ 200 million (Figure 11).

Figure 9
Maine forestry, logging & trucking jobs



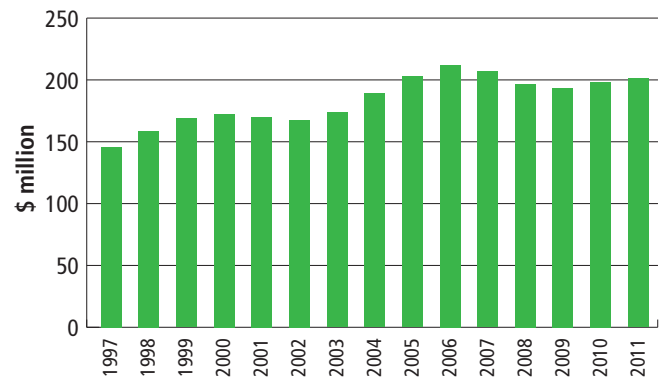
Source: U.S. Census Bureau – Census of Manufactures 2013 & industry estimates

Figure 10
Maine forestry and logging annual payroll



Source: U.S. Census Bureau – Census of Manufactures 2013

Figure 11
Forest products truck transport annual sales for Maine



Source: U.S. Census Bureau – Census of Manufactures 2013 and trucking industry non-published data

ECONOMIC MULTIPLIERS

The data used for economic output and jobs in this report are for direct jobs and output. All sectors of the economy have connections to other parts of the economy that are not recognized in direct jobs and output numbers. Economic multiplier formulas are often applied to better represent the effect of a sector on the economy. In the past reports like this from NEFA, economic multipliers have not been used for the forest products sector and sub-sectors. As in the past reports, the way the forest recreation jobs and economic value have been developed is by an industry standard that uses a multiplier-like approach to value the effect that the recreation economy has on Maine.

There are a number of readily acceptable economic multiplier formulas. We have chosen to use IMPLAN because it was created with the forest products industry in mind. Compared to an annual value to the economy of \$1.7 billion, with IMPLAN multipliers, the forest products economy is valued at nearly \$8 billion. Without multipliers, the forest products economy jobs are estimated at 19,433 and with multipliers 38,780 (see figure 29) jobs.

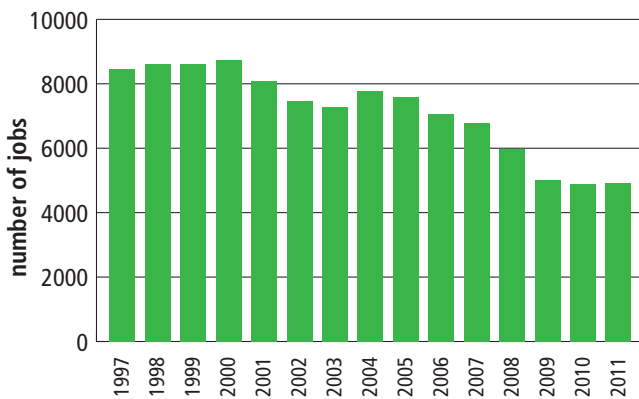


Primary manufacturing – wood products

Makers of lumber, veneer, oriented strand board, and particle board employ nearly 5,000 workers, down from a high of approximately 8,700 in 2000. Interestingly, during the period from 1997 to 2011, worker productivity skyrocketed. In 2011, it took about half the number of workers to produce the same value of wood products as in 1997³. Payroll in the wood products sector is approximately \$157.2 million annually. As seen in Figure 13, payroll has decreased from a peak of \$230 million in 2005 but has again increased since 2009.

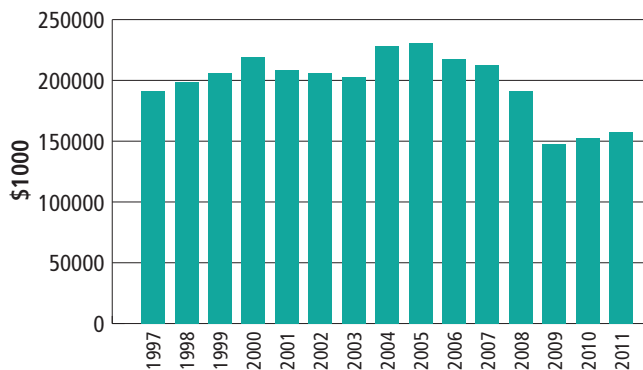
Finally, annual economic output, in the form of annual sales or value of shipments for the wood products sector is approximately \$800 million in Maine. This sector peaked with economic output of approximately \$1,260 million in 2005 but has increased from a low in 2009 to current levels.

Figure 12
Maine wood products manufacturing jobs



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

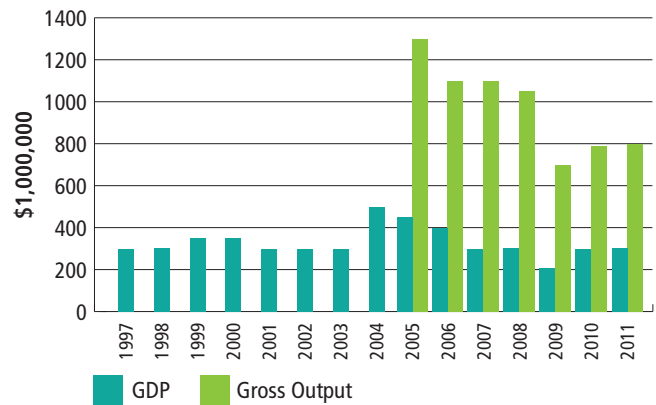
Figure 13
Maine wood products manufacturing payroll



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

3. Worker productivity analysis based on value of product rather than volume is complicated by the fact that prices per unit of product tend to rise with inflation over time.

Figure 14
Maine wood products manufacturing output



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

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.

Gross Output – Includes the total value of all products produced and shipped by all producers (essentially sales).

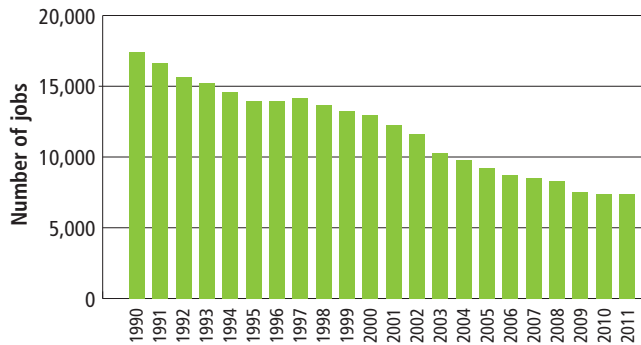


Pulp and paper

The pulp and paper industry combines primary manufacturing in the pulp facilities and secondary manufacturing in the papermaking section of the plant. In most cases, these two activities take place in the same facility. Maine's 10 pulp and paper manufacturing facilities employ over 7,300 workers, down from approximately 17,400 in 1990. Worker productivity in pulp and paper has also increased rapidly over the last 20 years. In 2011, it took approximately 20% fewer workers to produce the same amount of the value of pulp and paper products compared with 1997. Workers in this sector have an average annual salary of more than \$64,000, and it comes with excellent benefits. Payroll in the pulp and paper sector is approximately \$490 million annually. Payroll has decreased from a high of \$684 million in 2005 but has increased since 2009.

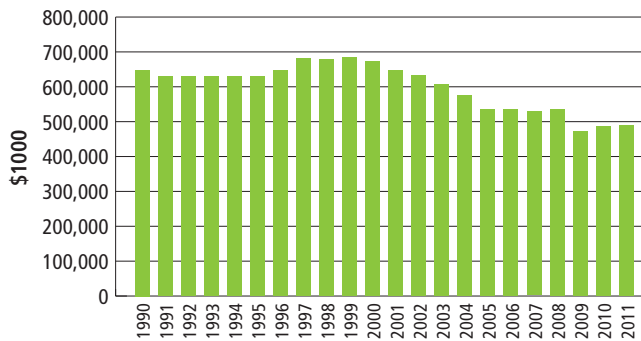
Annual economic output, in the form of sales or value of shipments for the pulp and paper sector, is approximately \$4 billion in Maine (Figure 17).

Figure 15
Maine pulp and paper manufacturing jobs



U.S. Dept. of Commerce - Bureau of Economic Analysis

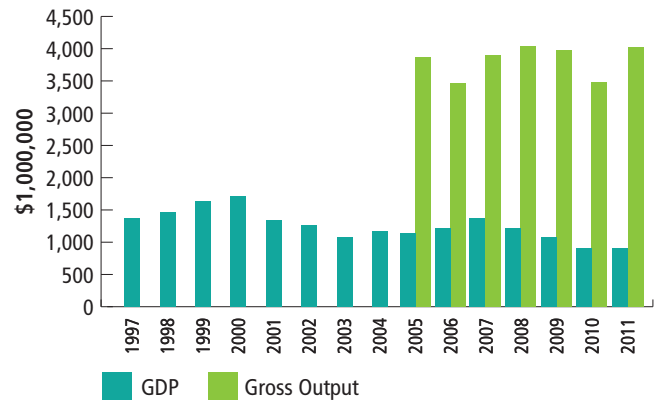
Figure 16
Maine pulp and paper worker annual payroll



U.S. Dept. of Commerce - Bureau of Economic Analysis & Maine Department of Labor

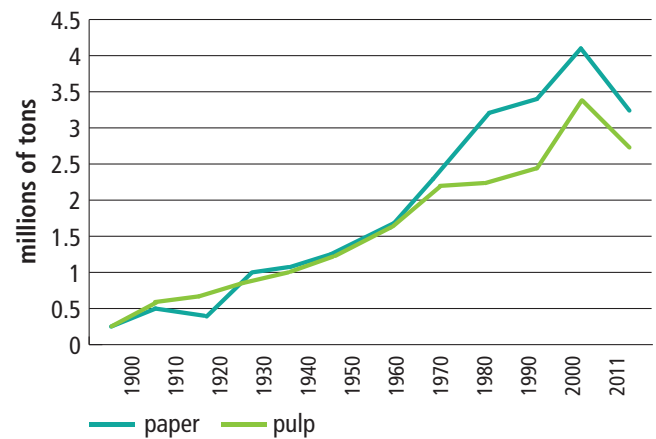
The price of pulp and paper affects sales trends, so actual pulp and paper production more clearly reflects what has occurred over time. Figure 18 shows that current production is higher than 1970 production but lower than the peak in 2000. Since pulp and paper produced in the northeastern U.S. are commodity products competing with similar products produced throughout the world, the drop-off since then is largely the result of the reduction in worldwide paper consumption and purchasers buying their paper elsewhere.

Figure 17
Maine pulp and paper output



U.S. Dept. of Commerce - Bureau of Economic Analysis

Figure 18
Maine pulp and paper production



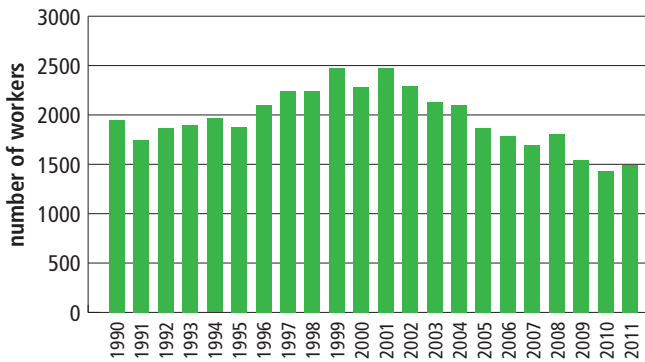
Source: Maine Pulp and Paper Association



Secondary manufacturing (furniture and related) – wood products

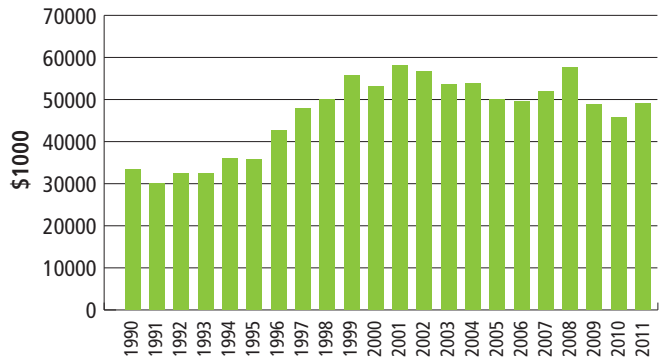
In the secondary wood products manufacturing sector – furniture, moldings, turnings and all production where the primary solid products are transformed into final or parts for final consumer products – Maine employs over 1,480, down from a high of approximately 2,480 in 2001. As in other sectors, worker productivity has increased rapidly over the last 20 years, more than doubling. Payroll in the secondary wood products sector is approximately \$49 million annually. It has decreased from a high of \$57 million in 2001 and 2008 but has increased over the last several years. Lastly, annual economic output, in the form of sales or value of shipments for the secondary wood products sector is approximately \$171 million in Maine (Figure 21).

Figure 19
Number of workers in secondary wood products manufacturing in Maine



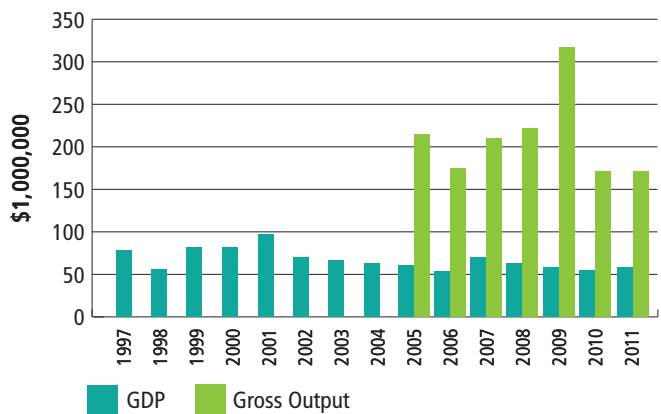
U.S. Dept. of Commerce – Bureau of Economic Analysis

Figure 20
Furniture and related products annual payroll for Maine



U.S. Dept. of Commerce – Bureau of Economic Analysis & Maine Department of Labor

Figure 21
Maine secondary wood products manufacturing



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

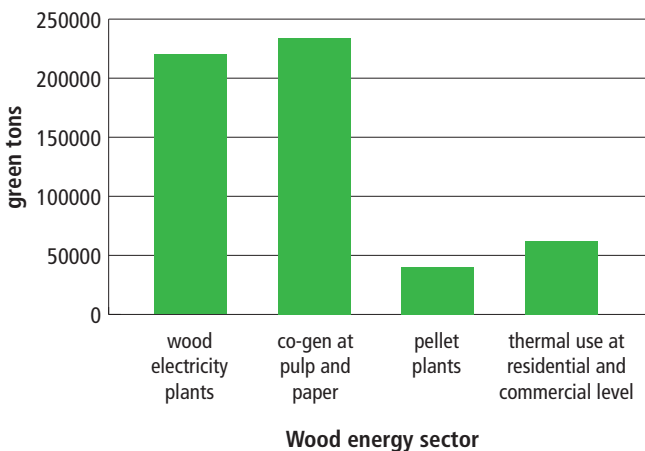


Wood Energy

While the last decade has seen wood energy gain increased attention at the national level, Maine has a long history of using wood for thermal and electric energy generation. Many Maine homes use wood as a primary or supplemental form of heating, and community-scale biomass applications, such as heating schools with wood boilers, is growing statewide. Maine has five operating utility-scale biomass plants, generating renewable electricity. Additionally, 10 pulp and paper mills have biomass energy plants at their locations.

Biomass fuel – most of which goes to fuel the biomass electricity plants and co-gen facilities at the pulp and paper mills – used approximately 4.6 million green tons of wood in 2011, largely harvested from Maine’s forest as part of normal timber harvesting operations.

Figure 22
Annual wood use for energy by sector in Maine



Source: Maine Forest Service and Innovative Natural Resource Solutions LLC

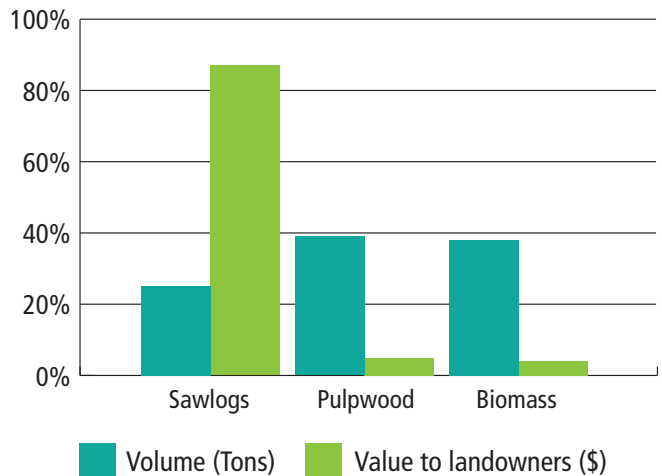
Wood use for heating using wood chips and wood pellets continues to grow in Maine. Four wood pellet manufacturing plants in Maine consume an estimated 400,000 green tons of feedstock raw material. Additionally, users of firewood, chips, and pellets to heat homes or businesses use some 600,000 green tons annually.

According to the U.S. Census Bureau, 2011 American Community Survey, an estimated 13% of Maine homes used wood as the primary or significant heating source, and a large number of homes also use wood for supplemental heat. Increasingly wood is fueling community-scale heating, such as schools and municipal buildings. More than 75 commercial facilities use wood chips or pellets for heating in Maine, and the number is increasing rapidly. Colby College, state

offices in Augusta, Northern Maine Medical Center in Fort Kent, Lakes Region High School, and Millinocket Regional Hospital are a few examples of Maine facilities using wood to heat their facilities.

Biomass energy generates electricity, provides heat, and is expected someday to be a source for liquid fuel. Biomass is a locally sourced fuel, and – unlike most other energy sources used in Maine – benefits the local economy through jobs in harvesting and processing, use of wood, and local wealth retention. Switching to biomass from fossil fuels often brings 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. In providing a market for low-grade wood, it provides 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. Today, homeowners who switch from using fuel oil to wood pellets can save up to 50% on their heating fuel bill – a huge savings. It is estimated that there are 325 direct jobs in the wood energy sector not including the timber harvesting and trucking sectors which are counted in another section of this report.

Figure 23
Typical volume vs. value of timber harvested in the Northern Forest region



Source: From typical harvest volumes and values in Maine, New Hampshire, Vermont and New York – state data

People sometimes question whether wood use for energy can be sustainable in Maine. Overall, as shown in Figures 6 and 6a, Maine is harvesting less than the forest is growing, which allows for the inventory of trees to increase over time. The value of



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 23 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 per ton of biomass chips harvested. 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. Loggers simply cannot survive on harvesting biomass chips alone.

Regardless of the kind of harvest, loggers have adopted best management practices to protect water quality, and nearly 59% of Maine’s forests are certified to Tree Farm, Forest Stewardship Council, or Sustainable Forestry Initiative standards. The helps ensure the sustainability of the harvesting.

Most of the energy wood harvested in Maine stays in Maine 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 from Maine mills. The local demand for Maine-produced wood pellets continues to be strong.

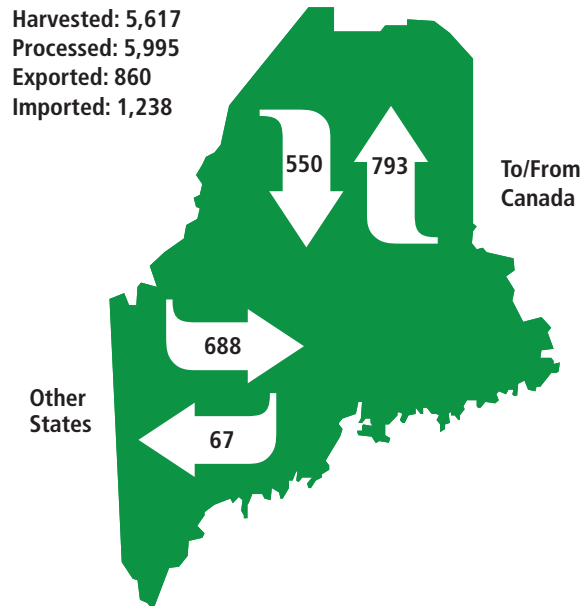
Christmas trees and maple syrup

The Christmas tree and maple syrup industries are small but well-recognized as important to the local economy. In 2012, the wholesale and retail sale of maple syrup and related products totaled \$12 million while Christmas tree sales were \$2.4 million. It is estimated that there are over 128 full-time equivalent jobs in the maple and Christmas tree sectors in Maine.

Wood Flows and harvest over time

Timber harvested in Maine does not all stay to be processed in Maine. Wood processed in Maine is not harvested exclusively in Maine. Wood flows, into and out of Maine, are based on many factors including proximity to markets, travel routes, backhauls, and business relationships, among others. In fact, Maine is a net importer of wood most years. Maine’s forest products industry provides markets otherwise not available to woodland owners in other parts of New England. Figure 25 shows the flows of wood in and out of Maine.

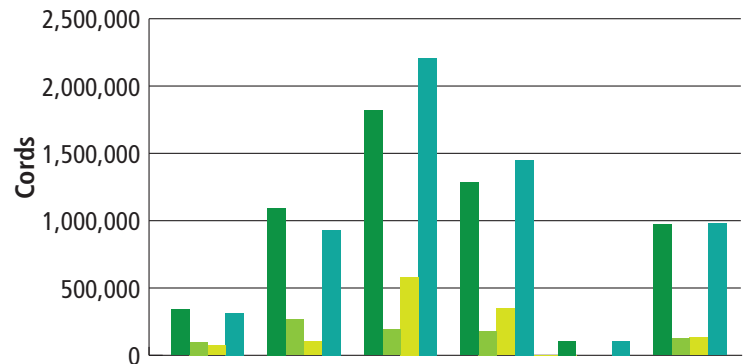
Figure 24
Wood Flows to and from Maine
- in 1000 cords



Source: Maine Forest Service 2011

Wood flows freely in the regional economy. States cannot regulate flow of wood products among states or to and from Canada under the interstate commerce laws.

Figure 25
Wood Flows in Maine, 2011



	Hardwood Sawlogs	Softwood Sawlogs	Hardwood Pulpwood	Softwood Pulpwood	Residential Firewood/Pellets	Biomass Chips
Harvested	341,424	1,094,820	1,819,659	1,283,407	106,478	971,299
Exported	97,178	266,248	192,205	178,529	-	126,126
Imported	72,248	102,958	582,708	346,955	190	132,990
Processed	316,494	931,530	2,210,162	1,451,833	106,668	978,163

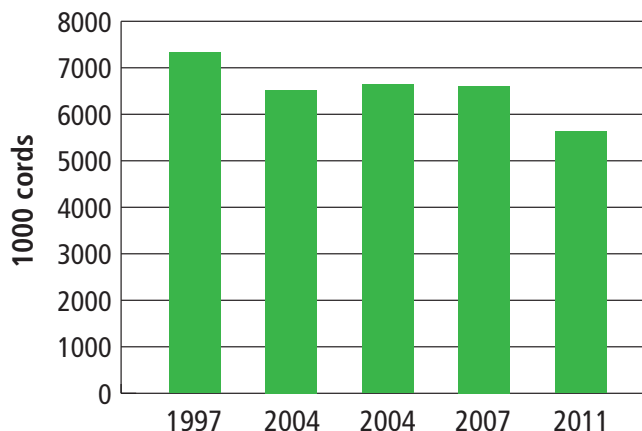
Source: Maine Forest Service

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. During that time period, however, the volume of timber harvested from Maine’s forest has



dropped from just over 7 million cords in 1997 to 5.6 million cords in 2011, with the latter year still part of the recession period (Figure 26). There is still a significant in-woods forest products economy.

Figure 26
Volume of wood harvested in Maine



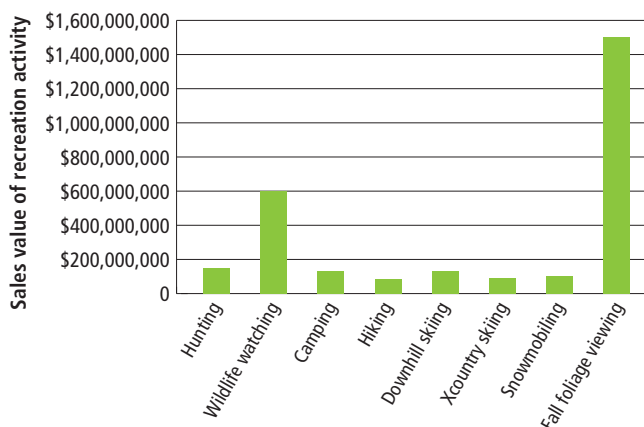
Forest-based Recreation/Tourism

Forests dominate Maine’s landscape, so a large percentage of recreation and tourism activities in Maine 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 forests of Maine. For fall foliage viewing, we assume a percentage of 100%. It is important to note that the method used for the forest recreation sector is a multiplier-like approach so that, if comparisons between the forest products sector and the forest recreation sectors are made, they should be based on the multiplier applied output and employment numbers previously reported.

The key data source for the economic value of forest recreation in past NEFA publications like this one has been National Survey on Recreation and the Environment from the USDA Forest Service. While this source is used again, 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. Because of this new data source, numbers in this report are not directly comparable to past reports for recreation and so trend data is not shown.

The forest-based recreational activities listed above contribute annually \$2.8 billion in sales to the Maine 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 over 45% of the total sales, and is followed by, in order, wildlife watching, hunting, downhill skiing, camping, snowmobiling, cross-country skiing and hiking (Figure 27).

Figure 27
Economic value of forest-based recreation economy in Maine 2011



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

About 19,800 people are directly employed in forest-based recreation and tourism with payrolls of \$296 million annually. Trend data is not supplied here as it is not directly comparable to past reports because of the use of new data sources. The recreation economy in Maine has, overall, not changed a significant amount since 2007.

Figure 28
Jobs and Annual Payroll – Maine forest recreation economy

Jobs	Payroll
19,853	\$296,115,811



Value of Ecosystem Services

The purpose of this publication is to show the economic value of the forest-related economy in Maine. The data provided shows those parts of the goods and services provided by Maine's forests that can be measured and, generally, has a monetary value placed on it within the economy. Other goods and services from Maine's forests are not so readily measured in dollars and cents, especially the natural assets called 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 discussed briefly but did not place a monetary value on.

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. A rough average of carbon being sequestered in Maine's forest that can be monetized in these new markets is likely between .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 an economic form humans understand best – money in a marketplace. Regardless, ecosystem services not yet monetized should be considered a valuable part of the forest-based economy in Maine.

Position of forest-based economy in the overall economy

The forest-based economy plays a significant role in the overall economy of Maine. Figure 29 shows that the direct annual value of the forest products component of the forest-based economy output is \$5.433 billion and then including forest recreation of \$2.800 billion, total \$8.233 billion.

Figure 29
Maine Forest-based economy vs. overall economy

	millions of	jobs*
Forestry, logging & trucking	\$240	5,200
Wood products manufacturing	\$797	5,000
Furniture and related product manufacturing	\$171	1,480
Paper manufacturing	4,000	7,300
Wood energy	\$209	325
Christmas trees and maple syrup	\$16	128
Sub-total direct	\$5,433	19,433
Sub-total multipliers	\$2,542	19,347
Sub-total with multipliers	\$7,975	38,780
Forest Recreation	\$2,800	19,800
Total	\$10,775	58,580

GSP, Forest Products Manufacturing	\$1,723
GSP, All Manufacturing, Maine	\$5,497
GSP, Total for Maine	\$53,656

*full-time equivalent jobs

Sources: U.S. Dept. of Commerce - Bureau of Economic Analysis & Census of Manufactures; USDA statistics, private data

MAINE FOREST SERVICE

The Maine Forest Service works to ensure that the trees and forest lands of Maine will continue to provide benefits for present and future generations of Maine people by:

- Developing, advocating for, and promoting activities that encourage the sound long term management of Maine's forest resources.
- Protecting Maine's forest resources from the effects of fire, insects, disease and misuse.
- Providing accurate, relevant, and timely information about Maine's forest resources.

You can reach the Maine Forest Service at 207-287-2791 or at www.maineforestservice.gov

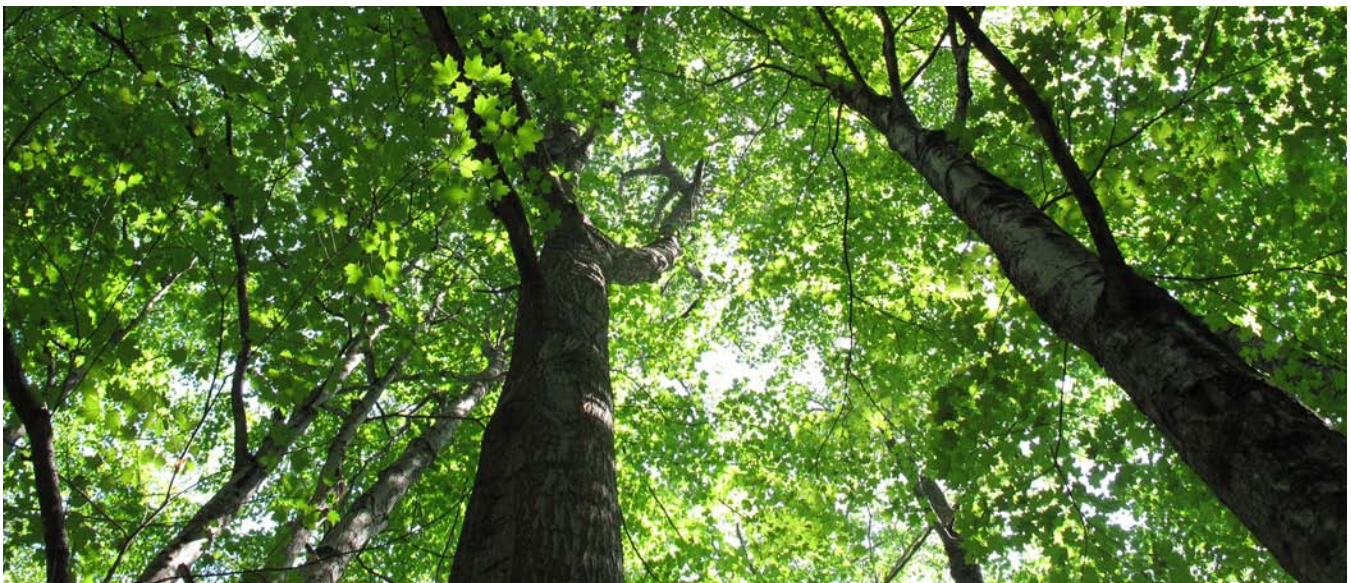
The National Association of State Foresters, a non-profit organization that is made up of the individuals who head the state forestry agencies in the U.S, periodically reviews information about the state agencies that oversee forestry in their respective state. The most recent report on this topic is "State Foresters by the Numbers: Data and Analysis from the 2010 NASF State Forestry Statistics Survey" and can be found at www.stateforesters.org website under publications.



Issues with potential to affect the future forest economy

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

- **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.
- **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 Maine's trees and provide for slightly longer warm weather periods each year for recreation in the woods. This phenomenon may benefit the forest-based economy. Should climate change also result in increased forest pest problems or reduce overall annual precipitation (or result in other changes), the perceived benefits could be offset.
- **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. The wood energy sector may be the only bright spot with markets growing over time, as long as the largest sub-component, the wood electricity generating plants, continue to operate since they currently make up the vast majority of the wood energy sector.
- **Reduced federal and state support for forestry assistance programs** – Certain forest activities, chiefly forest management by the tens of thousands of family woodland owners in Maine, 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 Maine Forest Service staffing levels are also being affected by state budget issues. It is expected, in these times of reducing federal budgets in discretionary spending, that cost-share opportunities will dwindle, resulting in less forest improvement work on the ground for that subset of the woodland owner population that has taken advantage of the cost-share opportunities.
- **Federal and state tax and other policies** – Business owners in the forest products and forest recreation sectors in Maine 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 Maine is based on individuals traveling from other locations to visit Maine 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 Maine. As transportation fuels continue to increase, fewer out of state tourists will visit the forests of Maine. On the other hand, an upward trend in transportation fuels can also result in more local populations choosing to stay for local recreation.



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North East *State* Foresters Association (NEFA)

NEFA'S Mission

The North East *State* Foresters Association (NEFA) is the State Foresters of Maine, New Hampshire, Vermont, and New York cooperating with the US Forest Service State & Private Forestry on issues of common interest (see www.nefainfo.org).

This booklet is part of a series on the economic importance and value of forest-based manufacturing and forest-related recreation and tourism of the four states in the NEFA region. Past reports can be viewed at www.nefainfo.org

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