



Industry News

■ **Cutting-edge timber technology** (Oct 15th)

The new technology - called cross-laminated timber, or CLT - is exciting architects, woods-economy boosters, and sustainable-forestry advocates. Cross-laminated timber technology was developed in Switzerland and refined in Austria during the 1990s. The material is essentially supersized plywood made of crisscrossed layers of dimensional lumber. It's strong enough to serve as a structural element and can be delivered to jobsites with window openings and fastener holes pre-cut; speed of construction is one of CLT's selling points for builders.

— *Northern Woodlands*

■ **Firm has applied to demolish former East Millinocket mill, state confirms** (Jan 18th)

A Florida-based demolition company, North American Recovery Management, has applied to raze buildings at the former Great Northern Paper Co. mill site despite a developer's interest in the facility. But the revised permit application filed with the Maine Department of Environmental Protection to tear down buildings at the Main Street site lacks some environmental information.

— *Bangor Daily News*

Industry Overview

Forestland Operations

Timber operations in the northeast began with a slow start because of the lack of consistent cold temperatures to support our winter harvest activity. We had what is now becoming a "normal" winter during most of the first quarter, where logging activity is not able to get much traction until late January. As winter usually represents the most active season for harvesting, by the time logging operations were able to begin in earnest, our contractor force had lost a good 2-3 weeks of productivity when compared to their plans.

Moreover, in mid-February the entire region experienced substantial warming, thawing out the woods and road systems. The streak lasted over two weeks, and several of the major haul roads – largely a privately controlled system – were temporarily shut down or were limited in terms of the haul weights. Not only did this cause concern among landowners & logging contractors to meet volume budgets, but also left wood buyers nervous about achieving inventory targets coming into spring.

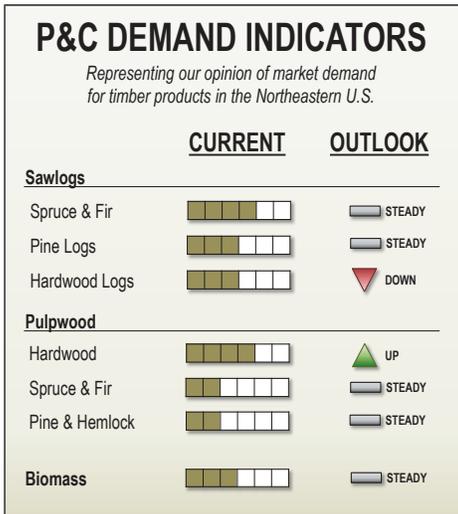


Wood piled at the side of the road during a winter cut-to-length harvest operation north of Baxter State Park.

Retrospectively, the warm period served as a reality check for everyone involved. For forest managers like Prentiss & Carlisle, this caused heightened awareness about a potential short winter, and we responded by tightening our built-in supply chain and ensuring the contractor force was keeping their in-woods inventory to a minimum for fear that it could be stranded if a road were to be shut down prematurely. Moreover our contractors realized they had to ramp up harvest productivity to make best use of a possible short winter before it was over.

As it turns out, Mother Nature was simply testing us. Cold weather set in quickly after that, and here at the end of the quarter, it seems she has yet to get serious about spring in the northeast. Nights are still cold, allowing us to maintain fairly stable logging & trucking even into April, and the dense heavy snow base that was formed in early March now takes the form of an appreciable snow pack in the woods. Our main goals this time of year for any harvest include minimizing damage in the woods, and managing our roads so as to keep them open for as long as possible to support extended nighttime trucking. Despite the mid-winter warm spell, we've been able to do both. Production of timber has therefore remained high throughout the quarter.

Forest Product Markets



It took surprisingly few weeks of warm weather in the middle of winter in order to loosen the restrictions that our major timber consumers had placed on wood deliveries, and to create a flicker of optimism in the marketplace. It wasn't long into the February warm spell when wood buyers could see the writing on the wall and began to get nervous about maintaining their supply. Delivery quotas that had been in place for some time were lifted or loosened, and procurement teams were making outbound calls checking in with suppliers, ensuring they would have enough wood, and reconfirming volume commitments.

It's no surprise that the northeast has seen significant challenges with the closures of various pulp & paper mills recently. Some have estimated that pulpwood consumption has fallen 40% or more in a few short years, throwing our industry into disarray. However, as we have reported in past newsletters, we have seen offsetting capacity increases at our consuming mills as well, either through extended production shifts, efficiency improvements, or direct capital infusion into new production initiatives. The influence this has had on demand cannot be ignored. The current available supply of timber certainly outweighs the demand, however the roller-coaster winter this year seems to have put everyone on notice that the markets are probably slightly closer to equilibrium than most people thought 8 months ago.

Pulpwood Products

When we looked at the world coming into the start of 2017, the regional pulpwood markets could get all the wood they needed a short distance from the mill, which enabled them to keep transportation and sourcing costs low. Because transportation costs can make up a large proportion of overall sourcing costs for pulpwood, mills obviously preferred to buy wood as locally as possible. However, here in late winter, with questionable road systems and weight restrictions as well as with the attrition of a sizable portion of the region's contractor force, we have seen some mills once again reaching out in excess of 100 miles in order to procure their required supply. This has come as a surprise to nearly everyone, most of all wood buyers who were expecting to coast through winter with relative ease. In fact, we have seen some pulpwood buyers willing to pay seasonal premiums to ensure consistent wood flow. Consequently, throughout the quarter, most if not all pulpwood had little difficulty finding its way to market.



■ **Early U.S. softwood lumber finding stokes fear of job losses in Canada** (Jan 16th)

The U.S. International Trade Commission says it has found there was a reasonable indication that softwood lumber products from Canada materially injured American producers, setting the stage for the imposition of preliminary duties that softwood producers fear could impact Canadian jobs. The trade commission announced that it made an initial determination of harm from Canadian lumber that is "allegedly subsidized and sold in the United States at less than fair value."

— *The Canadian Press*

■ **Maine Pulp and Paper Association folds** (Jan 16th)

The Maine Pulp and Paper Association, a trade group with 21 members, has folded, citing closures of six pulp and paper mills in the last three years had resulted in the loss of financial support for its operations.

— *Maine Biz*

■ **Rising fiber costs threaten Russian pulp & paper industry** (Jan 18th)

The Russian Pulp & Paper sector is export-oriented, and Russian producers compete with other long-fiber pulp and paper product producers in global markets. Due to the recent depreciation of the local currency (ruble), Russian producers have a reprieve; among the lowest cost producers in the world, they are currently enjoying high margins.

— *Forest2Market*



Although pulpwood pricing remains well below where it has been in recent years, it continues to play a very important role in the economics of almost every commercial harvest operation in the northeast and northcentral U.S. Hardwood pulpwood – which grows in abundance across our region -- is still a large component of the volume that is sold in the northeast, and because of its widespread presence, it is a necessary byproduct any time a harvest is undertaken. Moreover, it is an important factor in timber stand improvement initiatives – to grow the high-quality trees we want, the weeds must be removed. Nearly 85% of the hardwood volume in the northeast forest is sold to pulpwood markets. Although demand has fallen, to have the markets in place to consume this wood is a blessing to say the least.

In contrast, only 10-15% of the softwood volume produced falls to the pulpwood market; the majority goes into higher grades such as dimension lumber. The recent mill closures have almost all been softwood pulpwood consumers, so there is much less consumption of this product in our region than there has been historically. Most of the softwood pulp being made today originates not out of the forest, but is produced as a residual in the sawmilling process and is sold by sawmills to pulp mills. Consequently, there is currently very little opportunity for landowners to sell tree-length softwood pulpwood directly from the woods. However, given the choice, we would rather have these sawmills healthy and able to sell their residuals into the pulp market than to be able to sell it ourselves to the mills in tree-length form.

Overall, because the tail end of winter has lasted longer than expected, raw material inventories at our regional pulp mills have filled, however it was in the 11th hour that it seemed they finally got comfortable. As we enter our mud season, the mills are prepared get through in an average spring, however if spring lingers at all like winter did, they may begin to see thin inventories by June.

Sawn Products

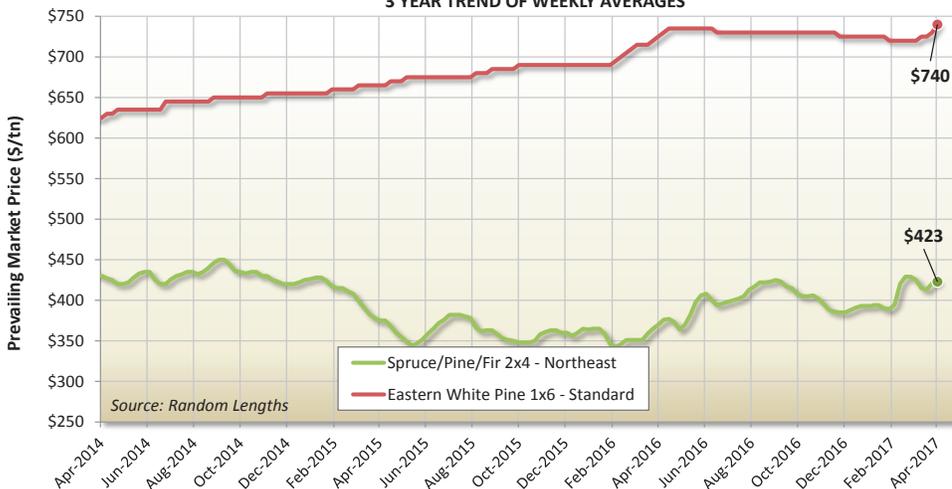
Softwood

With softwood lumber pricing continuing its upward trend through the quarter (see chart below), our regional dimension sawmills have attempted to maintain high production levels. Although the global commodity pricing isn't necessarily seasonal, this is the time of year for optimism in the lumber markets because the departure of winter nearly always spells an increase in new housing construction.

With lumber prices strong, one might expect that sawmills are producing lumber at or near

PRICE TRENDS IN SOFTWOOD LUMBER

3 YEAR TREND OF WEEKLY AVERAGES



capacity, however that is not the entire picture. While all our regional mills have the ability and desire to ramp up lumber output above current levels, management of their residual

■ **First chapter in comeback story for rural Maine?** (Jan 19th)
Maine's forest products industry is getting a \$1 million boost from the federal government to implement a strategic plan for capitalizing on promising new markets for wood products, including wood fibers not used in the papermaking process that can be converted into biomaterials for manufacturing a host of products.
— *Maine Biz*

■ **Interior lumber supply falling, mills threatened** (Jan 31st)
A decade after billions of mountain pine beetles chewed their way through British Columbia's lodgepole pine forest, the Interior timber supply has begun a dramatic drop. The beetle killed 54% of the merchantable pine that was to be harvested. But in some areas, specifically the central Interior, 80% to 90% of the merchantable pine was killed. That's where the impact is going to be felt more significantly.
— *Prince George Citizen*

■ **The state of the N.E. regional pulp market** (Feb 1st)
It's no secret that Maine has lost pulp mills in recent years and it's hard to find a logger or landowner that hasn't been impacted by these markets losses. However, the rapid loss of markets - coupled with a diverse forest industry still operating throughout the region - suggests there has never been a better time to develop a project that utilizes low-grade wood, particularly softwood.
— *The Northern Logger & Timber Processor*

chips, shavings, and sawdust continues to be a bottleneck constraining production. In general they would love to produce more lumber, however that cannot be done without producing more residuals, and weakness in the softwood pulp markets means pulp mills cannot absorb the material fast enough. This is precisely why softwood pulp markets are so important to sawmills and landowners alike.

There is a significant amount of variability in the raw material inventories at our regional saw mills. One customer reported they had an uncomfortably high 15 weeks of logs in inventory, while another reported enough material for just six weeks, an equally uncomfortably low amount. The balance falls somewhere in the upper-middle of this range, and deliveries to all these facilities will begin to taper off as our cutting season winds down.

April 24th will be an important date for anyone involved in the North American trade of softwood lumber. That's when the U.S. Department of Commerce is expected to issue its preliminary ruling on countervailing duties to impose on Canadian imports of softwood lumber. Most industry observers expect a substantive tax to be imposed, which will be damaging for our markets in the northeast. In one of the longest trade disputes between U.S. and Canada, U.S. lumber producers have long argued that Canadian wood is unfairly subsidized by the government and have sought to impose restrictions they believe would level the playing field. We feel, however, the story is more nuanced – the so-called Quebec Border Mills, among others, acquire a large part of their wood from the U.S. log markets and participate in open market rates. Because of this proximity and interdependence with the U.S., we believe they deserve unique treatment. Ultimately, we're not sure how far this argument will go in today's political environment, which has demonstrated a clear protectionist tendency on trade issues. Regardless, restrictions on the over-the-border wood flow represents a real concern for U.S. landowners, and we believe will put pressure on an already stressed industry.

The regional markets for hemlock have been saturated for some time now, and many producers have been on quota for most of winter. One hemlock mill in Maine has recently upgraded their equipment and is on the cusp of coming up to full speed again. They are good proven sawmillers and we are optimistic their investment will pay off and lead to an increase in the local consumption of hemlock.

Coming into winter, it appeared as though the pine markets were going to be flooded quickly. This has been a robust market in recent quarters, and as a result contractors ramped up production of pine. In fact, during the first part of the first quarter, our regional pine mills placed quotas to restrict deliveries for the first time in recent memory. However, due to the mid-winter thaw, and contractors responding to quotas by shifting their harvests away from pine, the market appears to have quickly shifted back in balance again. As we have mentioned in prior editions, pine is one of the forest's most perishable products, so mills are quite cautious this time of year when buying raw material.

Hardwood

Prices for hard maple lumber, which represent a substantial portion of overall hardwood trade in the northeast, have been on a steady decline since June, but appear to have stabilized for the last part of the quarter. For the moment, the biggest struggle for mills producing hard maple lumber has been selling and maintaining price for the higher grades. Raw material inventories at most hardwood sawmills are full from winter deliveries, and the next order of business for hardwood mills is to get their maple sawn & dried before the heat & humidity of summer puts maple at risk of spoiling.

Industrial timber mats and pallet-grade timbers are still being produced regionally although



- **Sappi mill in Skowhegan to get \$165 million machine upgrade** (Feb 8th)

Sappi paper mill in Skowhegan announced a \$165 million paper machine rebuild project at the Somerset County facility. Sappi described the "significant investment" as resulting in "further enhancement of offering to graphic paper customers". The project, expanding the machine's overall capacity and ability to make consumer packaging products, is planned to be finished in early 2018.

— Portland Press Herald

- **With mills struggling, a Maine lumber firm is building a biomass plant** (Feb 11th)

The shuttering and shrinking of paper mills has forced businesses across the forest products industry to take a fresh look at their approach. So Robbins Lumber of Searsport is building a \$36 million, 8.5 megawatt biomass plant, with capacity to sell about 7.5 megawatts to Central Maine Power. Robbins Lumber hopes the project will help bolster the local forest economy, while giving the lumberyard something to do with its residuals - chips, sawdust and bark - in the wake of the paper mill closures.

— Bangor Daily News

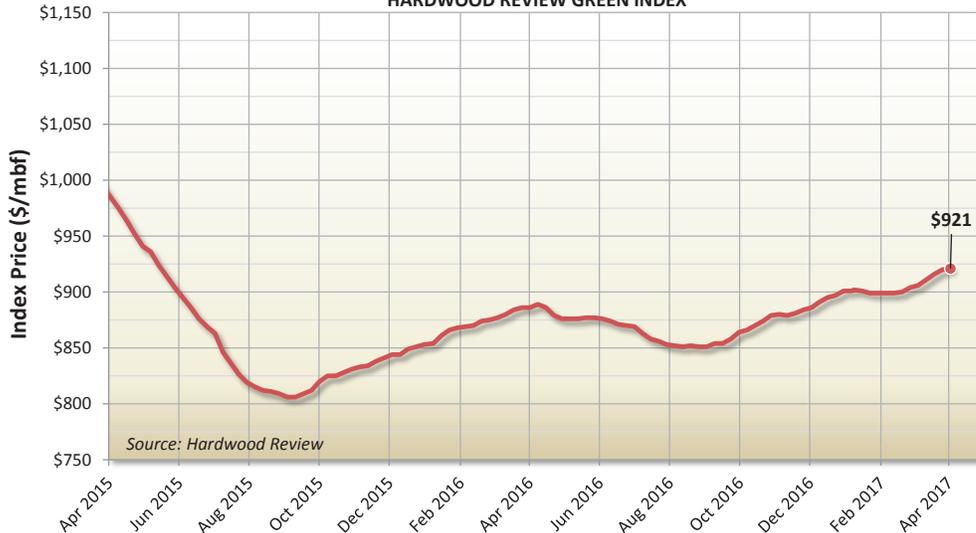
- **Pine beetles could devastate Alabama's \$118B forest industry this year** (Feb 12th)

This year's concerns are rooted in the large number of trees left stressed or already dying from last year's record setting drought. Foresters fear the dead or dying trees left by the drought could provide fuel for a similar large-scale infestation, and are already seeing evidence of increased beetle activity, even though outbreaks usually don't flare up until the late spring or early summer.

— AL.com

RECENT PRICES IN HARDWOOD LUMBER

HARDWOOD REVIEW GREEN INDEX



the market doesn't seem to be quite as deep as it used to be. Demand for the logs is still present but has cooled down in the last year.

Softwood lumber isn't the only regional wood market directly affected by international trade matters. In the last few years hardwood log exports to Asia and Europe are having increased influence on local supply and demand, and today there is a good degree of uncertainty around the impact of increased national attention on trade policy. Should the U.S. place restrictions on imports, there is concern about potential retaliatory moves on U.S. exports. Foreign wood products imports are of particular concern to one regional producer of hardwood products, who is worried about not having enough imported finished goods supply to meet the demand of their U.S. customers and is considering shifting manufacturing to higher-cost domestic facilities. On either side of the trade equation, there is little doubt our regional markets will be shaped by national policy decisions.

Biomass

The region has seen several idled biomass generation facilities start up in the fall, in part due to some government funding assistance. These biomass consumers have continued to run through the winter. We also have recently seen some better than expected consumption of biomass at our regional pulp mills, despite the low cost and wide availability of their primary fuel – natural gas. We believe this is a recognition of the longer-term strategic importance of keeping a diverse fuel supply. In fact, one pulp mill has even committed to consuming at least some woody biomass year-round, citing a desire to keep their network of logging contractors healthy and viable. This is an important step for a market which has languished in recent years.

Benjamin D. Carlisle
PRESIDENT



LANDOWNER
update

1st Quarter 2017

- **Daines, Tester Introduce Timber Innovation Act** (Feb 20th)
High-rise wood-framed buildings are a rarity in the US, but that may change with the help of a bipartisan bill that calls for accelerating research and development of tall wood buildings. U.S. Senators Steve Daines and Jon Tester have introduced to legislation the Timber Innovation Act, they say would support Montana's timber industry, create jobs and boost research to find innovative ways to use wood in the construction of buildings above 85 feet in height, or roughly seven or more stories.
— Flatheadbeacon.com

- **Canada's first biomass torrefaction plant fully operational** (Feb 24th)
On Feb. 24, Airex Energy officially inaugurated its biomass torrefaction plant, in Becancour, Quebec, which required around \$10 million in public and private investments for its design, construction and start-up. The facility will produce biocoal and biochar, materials that can be used for combustible energy, water purification, soil remediation and metallurgy.
— Canadian Manufacturing

- **China turns to western NC trees for wood flooring and furniture** (Mar 30th)
North Carolina's timber exports to China have skyrocketed in recent years. It's a trend reflected nationwide as more timber harvested in the United States is shipped to the world's most populous country, where it is milled into furniture, flooring and other high-value products for buyers there.
— Journalnow.com

Northern Forest Futures Project: A Review

by Sam Radcliffe, Vice President

In 2016 the USDA Forest Service completed a large study examining the future of northern forests in a 20-state region – most of which comprises the operating region of Prentiss & Carlisle (Figure 1). The goal of the multi-year Northern Forest Futures Project (NFFP) was “to forecast how known and emerging natural resource and societal trends will alter the character of tomorrow’s forests and how the resulting changes will alter the ability of forests to contribute to the wellbeing of people and communities.”¹ Obviously, such forecasts could potentially be of great value to P&C and its clients as we develop strategies for managing the nearly two million acres of forest land under our charge.

The culminating report² (“2016 report”) entitled “Future Forests of the Northern United States” summarizes the project but it is just one of several outputs with potentially useful information and analyses. There is also a report³ (“2012 report”) on baseline conditions, two reports on outdoor recreation trends⁴ and projections⁵, a web-based “dashboard” for summarizing and visualizing state and regional data⁶, and a downloadable Access database⁷ of relevant forest conditions data.

The overall approach of the project involved three general steps: (1) assess current forest conditions; (2) develop alternative futures based on identified issues and trends, and; (3) project forest conditions that would result from the alternative futures, for the period 2010-2060.

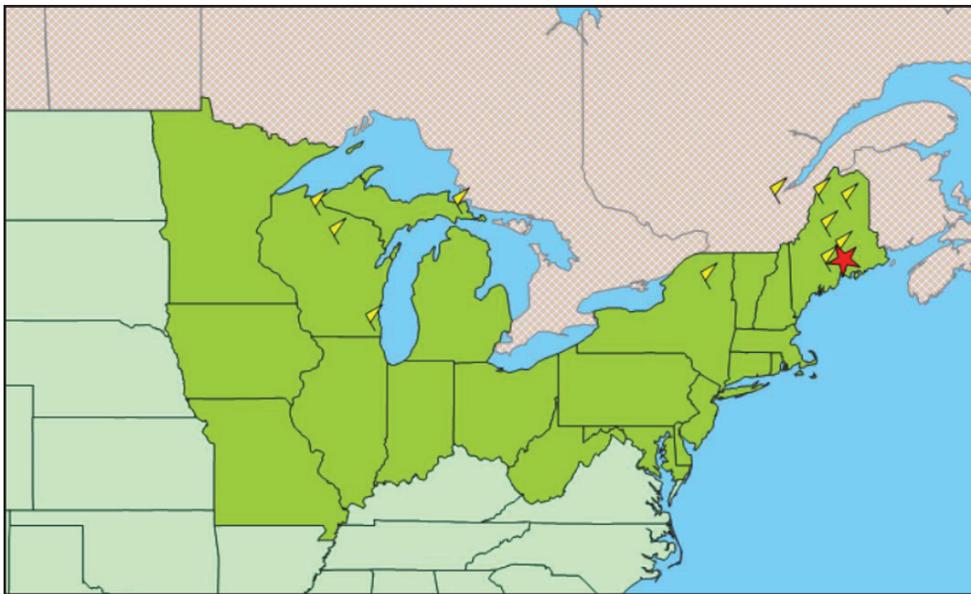


Figure 1. The Northern Forest Futures Study Area and P&C Office Locations.

Assessment of Current Forest Conditions

The project’s assessment of forest conditions is based primarily on analysis of data produced in the Forest Service’s Forest Inventory and Analysis (FIA) program, the system of permanent sample plots located on public and private lands throughout the country. The underlying data is not new information and is available elsewhere in detail. But unlike standard FIA reports, the NFFP organized data and analyses in the context of the Montreal Process criteria and indicators framework. To seven broad Montreal Process criteria was added an eighth on urban and community forests:

1. Conservation of biological diversity
2. Maintenance of productive capacity of forest ecosystems



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■ **Loggers butt heads with LePage over biomass contract changes** (Apr 7th)

An association that represents Maine loggers this week expressed opposition to proposed changes in a 2016 biomass industry bailout bill that allocated \$13.4 million in state subsidies to companies that produce energy with products supplied by loggers.

— Bangor Daily News



3. Maintenance of ecosystem health and vitality
4. Conservation and maintenance of soil and water resources
5. Maintenance of forest contribution to global carbon cycles
6. Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies
7. Legal, institutional, and economic framework for forest conservation and sustainable management
8. Urban and community forests

From the perspective of industrially-oriented timberland investors, this organization is not particularly helpful. For example, information on forest ownership patterns, which has relevance to the assessment of timber supply, is found under the criterion related to conservation of biological diversity. Nevertheless, there are numerous informative graphics and tables within the 2012 report, such as the state-by-state comparisons of inventory trends. For example, Figure 2, taken from the 2012 report shows that inventories in Michigan and Wisconsin have continued to increase throughout the 2000's while Minnesota inventory leveled off, as did Maine inventory several decades ago.

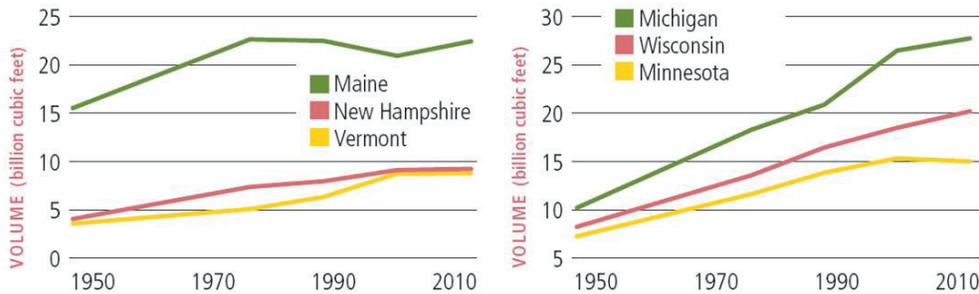


Figure 2. Growing-stock Volume on Timberland by State, 1953 to 2007.

One of the strong points of the project is that it brings together data beyond the standard FIA inventory statistics to weave its story. For example, landowner surveys were used to show that the number of private landowners increased and the average parcel size decreased from 1993 to 2006, suggesting a significant change in acres under management for timber.

It seems as if the language of economics was scrupulously avoided throughout the reports. The ratio of annual growth to removals – a common metric to indicate timber supply/demand balance – is referred to in the 2012 report as “an indicator of the intensity of wood utilization”. The ratio is portrayed as a result of “management intensity and product utilization” rather than of economic availability, markets, and prices. Management intensity has nothing to do with high growth/removals ratios in place such as Delaware, Rhode Island, Illinois, Indiana, and New Jersey. Notably, in Maine growth and removals are roughly in balance while in Michigan and Wisconsin growth is about twice the level of removals.

Similarly, in sections on insect and disease risks, several damaging insects are discussed but often in the context of landscape disturbance or urban forest concerns rather than regional economics. In Maine, Michigan and Wisconsin outbreak populations of spruce budworm are expected within 3 to 10 years. During the last outbreak in Maine in the 1970's and 1980's this pest killed millions of acres of spruce-fir stands, and cost the region's economy many hundreds of millions of dollars⁸.

Alternative Futures

Current (2010) forest conditions were projected for fifty years under different scenarios. Specification of the alternative futures is perhaps the most difficult aspect of the project to understand. It starts with four “storylines” adopted from the Intergovernmental Panel on Climate Change (IPCC) which represent sets of assumptions about future global socioeconomic conditions and are given cryptic names A1, A1B, A2 and B2. We are told “The key point for readers is that the labels identify relatively high (A2), medium (A1, A1B), and low (B2) future emissions of greenhouse gases.” It is understandable why the IPCC would focus on greenhouse gases as a distinguishing characteristic, but that simplification says nothing about the world in which those gases were generated. Based on Table 1, the labels identify a world with a continuum of very high (A1, A1B) to medium (A2, B2) global economic growth and energy use. They are associated with medium (A1, A1B) to low (A2, B2) economic growth in the US. It would be useful to know what “high, medium, low” represent in terms of numeric GDP growth rates.

Table 1. Descriptors of IPCC Storylines Based on Table 2.1 in the 2016 Report.

Storyline	Economic Growth		Population Growth		Global Energy Use	Greenhouse Gas Emissions	Movement Toward Renewable Energy
	Global	US	Global	US			
A1	Very High	Medium	Medium	Medium	Very High	Medium	Rapid
A1B			Medium	Medium			Medium
A2	Medium	Low	Medium	Low	High	High	Slow
B2	Medium	Low	Medium	Medium	Medium	Low	Medium

The next step in scenario development involved coupling the storylines with general circulation models, which estimate the temperature and precipitation change associated with the different levels of greenhouse gas emissions. Apparently, the Forest Service has developed procedures by which these climate changes can be assigned to individual FIA plots.

The final step was to couple storyline/circulation model combinations with assumptions about harvest levels. This was the most disappointing aspect of the project because the harvest levels seemed to be externally developed rather than estimated as a response to alternate economic and energy futures. Two harvest levels were used: continuation of recent trends, or increased harvesting with more wood biomass used for energy.

The combinations of storylines (4), circulation models (6) and harvest levels (2) could have resulted in 48 different scenarios. Ultimately thirteen scenarios were analyzed, with seven labeled “primary” and more heavily reported on in the 2016 report. Figure 3 shows the projected harvest levels for the seven primary scenarios. Unlike conventional forest projections, all scenarios are treated as equally likely. This places a great burden on the reader who is interested in the condition of our forests but does not regularly study the U.S. and global economies.

Table 2. Descriptors of Primary Scenarios Analyzed in the NFFP.

Scenario	Harvest Assumption	Economic Growth		Movement Toward Renewable Energy	Global Energy Use	Greenhouse Gas Emissions
		Global	US			
A1B-C	Recent Trends	Very High	Medium	Medium	Very High	Medium
A1B-BIO	Increased Biomass					
A2-C	Recent Trends	Medium	Low	Slow	High	High
A2-BIO	Increased Biomass					
A2-EAB	Recent Trends					
B2-C	Recent Trends	Medium	Low	Medium	Medium	Low
B2-BIO	Increased Biomass					

Projection Results

In the 2016 report, the modeling results are presented in the form of individually authored essays on the eight Montreal Process criteria listed above. Detailed numeric projection data is found in the appendix, and a great deal of detail is contained in the available Access database.

Some of the more interesting findings:

- If harvesting rates observed in the recent past continue into the future, differences in projections of forest conditions in the northern region would be small. (Figure 4)
- Differences were found to be modest until at least 2040 among the scenarios that continued with current rates of harvest, and there was no evidence that over this period the effects of climate change would overwhelm the changes resulting from forest aging, species succession, harvest, and land-use conversion.

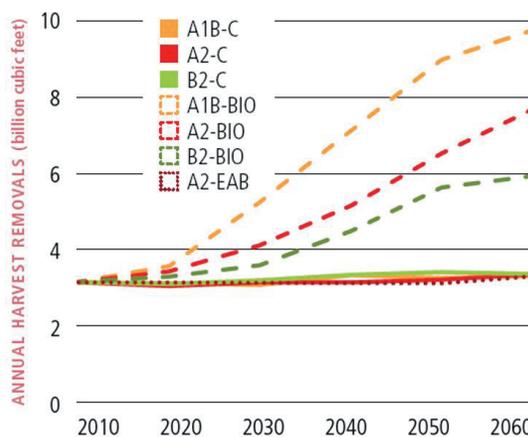


Figure 3. Projection of Timber Harvest Levels Under Seven NFFP Scenarios.





- The levels of increased biomass harvesting for energy assumed in three scenarios appear to be too large to be sustainable through 2060. (Figure 4)
- Under all projections for northern forests, the growth-to-removals ratio would be <math><1.0</math> (indicating an unsustainable situation over the long term) from 2035 to 2055; by 2060, the ratio would increase to 1.2 if harvesting rates observed in the recent past (2003 to 2008) continue into the future.
- Paper and paperboard production is projected to be variable in the next decade and is expected to decrease before 2060 under scenarios that assume a constant rate of harvesting without added demand for bioenergy feedstocks.
- Production of lumber and wood panels is expected to increase under a scenario that assumes large gains in urbanization but would decrease under scenarios that assume smaller gains in urbanization.
- The removals in Pennsylvania, Michigan, Maine, and Wisconsin are expected to account for about half of the total removals in the North. Predictions suggest that hardwoods will continue to dominate timber production and account for about three-fourths of total removals.

My biggest criticism of the project is that the biomass harvesting scenarios are extremely unlikely. The economics of biomass production and utilization are such that resources are typically limited to forest and mill residues which can be transported only relatively short distances. Production of biomass is a by-product of production of traditional forest products, so the two harvest paths cannot diverge as dramatically as shown in Figure 3. The only way such massive biomass production would become economic is through drastically increased energy prices, which is the opposite of what many are predicting for the coming decades. The U.S. may in fact become a net exporter of oil and gas, suggesting very low prices. Regardless, the type of inventory drawdown due to biomass production depicted in Figure 4 would not likely be politically feasible. In using this report, I recommend completely ignoring the biomass scenarios.

That leaves us with four scenarios, all of which result in essentially the same future, when statistical and modeling uncertainties are considered. Given that IPCC work drove scenario development, it is ironic that climate change insignificantly impacted the projections of future forest conditions.

In the end, it seems like the scope of this project was too large in terms of geography and issue definition to be useful for private strategic planning. The diversity of economic and forest conditions within the 20-state region prohibits useful region-wide conclusions, although the database with detailed state projections could prove useful. Even that projection detail though is tied to scenarios that have little granularity or range of possible futures with respect to timber supply and demand. In our business, it makes more sense to think globally and forecast locally.

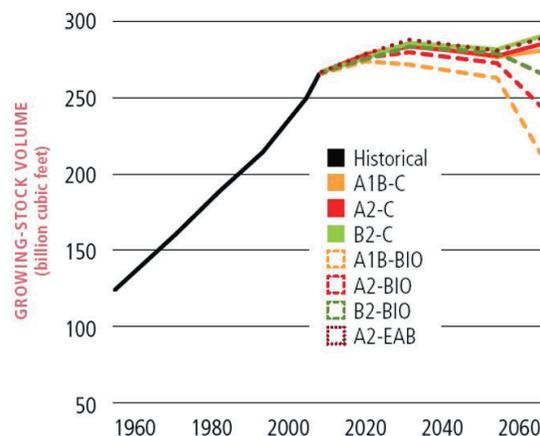


Figure 4. Projection of Growing Stock Volume Under Seven NFFP Scenarios.

1. <https://www.nrs.fs.fed.us/futures/about/>
2. Shifley, Stephen R.; Moser, W. Keith, eds. 2016. Future Forests of the Northern United States. Gen. Tech. Rep. NRS-151. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 388 p.
3. Shifley, Stephen R.; Aguilar, Francisco X.; Song, Nianfu; Stewart, Susan I.; Nowak, David J.; Gormanson, Dale D.; Moser, W. Keith; Wormstead, Sherri; Greenfield, Eric J. 2012. Forests of the Northern United States. Gen. Tech. Rep. NRS-90. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 202 p.
4. Cordell, H. Ken; Betz, Carter J.; Mou, Shela H.; Gormanson, Dale D. 2012. Outdoor Recreation in the Northern United States. Gen. Tech. Rep. NRS-100. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 74 p.
5. Bowker, J.M.; Askew, Ashley E. 2013. Outlook for outdoor recreation in the northern United States A technical document supporting the Northern Forest Futures Project with projections through 2060. Gen. Tech. Rep. NRS-120. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 62 p.
6. <https://www.nrs.fs.fed.us/futures/projections/>



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