Prentiss & Carlisle

LANDOWNER update

2nd Quarter 2017

Industry News

- ***Supporters say saving N.H. biomass would boost state's forestry industry*** (Apr 11th) Members of the timber industry were in the state capitol today, arguing for the passage of a bill that would support the state's struggling biomass industry. The Senate bill is under consideration by the House. If passed, advocates for the biomass industry estimate that New Hampshire energy consumers would pay about 16 cents extra a month for the subsidy.

  — New Hampshire Public Radio

- ***Trump's building promises energize lumber prices*** (Apr 17th) The lumber markets are off to a robust start in 2017, as U.S. housing data show that the number of new homes available - along with the sale of new homes - are rising. Lumber futures prices on the Chicago Mercantile Exchange have been rising and could surpass their recent highs in late February. Finally, if President Trump is successful at getting his policy initiatives passed, lumber prices should rally further.

  — Bloomberg

Industry Overview

Forestland Operations

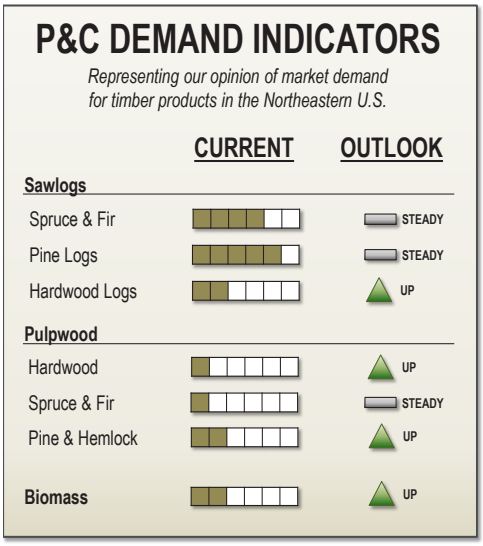
Wetter and colder than normal weather throughout the northeast during the second quarter heralded in a delayed start to our summer timber harvesting operations. To minimize forest damage, it is normal for logging crews to hold off from entering the forest until the soils dry out and the trees begin absorbing water for the growing season. During a typical spring, mid-May is when most northern areas begin to see suitable soil conditions – however, the persistent rains this season prolonged the lull in activity commonly referred to as “mud-season”. In addition, prevailing cold temperatures during the early part of the quarter kept winter's frost in the ground longer than usual and slowed the necessary draining process.

Once harvesting got going, most of our spring operations were completed as planned, however our foresters had to pick our days of operation carefully during the intermittent weather. In mid-late June, the region saw a series of sudden but intense storm systems roll through, where our road network and water management systems were forced to handle high volumes of water in very short periods of time. Depending on the topography of where this happens, weather events like this can cause flooding, damage the road systems, and can even create dangerous operating conditions.

As a result of these weather-related startup delays, from a timber production standpoint, harvesting remains approximately 2-3 weeks behind an average year. Given that we are a month or two away from the peak production of our summer harvest season, we have a good amount of catching up to do.

Forest Product Markets

Six months ago, we predicted that the winter of 2017 would go down as one of the most difficult market environments for forest products in recent memory. Despite finished product prices remaining elevated, the loss of regional consumption capacity had been creating a supply glut of raw material, and mills had been enforcing restrictions on timber deliveries to help stem the tide.



Fast forward through the winter, and now, it's clear to most market participants that it could have been much worse. Although pricing has by no means recovered, and some traditional products in remote areas can provide only a marginal return, most of the forest products that are being produced have a market.

Regional supply and demand has been out of balance for a long time, but we are slowly adjusting back to equilibrium. We believe there are several significant reasons why we are now closer to a balanced marketplace:

- Although it has been substantial, the overall net reduction in regional market demand was less than initially thought. Consumption at the remaining regional pulp mills has been strong and in some cases increasing, which has partially offset the demand loss from mill closures.
- The fundamentals of the economy, which have supported the global forest product market, are largely unchanged since the regional market crash.
- Timber harvests, which can take considerable time to plan and complete, have adjusted so that the harvested products being produced match what can be sold to the marketplace.
- Landowners have reduced cut levels in response to lighter demand and have tempered their expectations for stumpage return to align with the market.
- Logging capacity, and therefore timber production, has been permanently reduced as strained loggers exit the industry.
- Substantial quantities of surplus timber stored in various links within the regional supply chain has now had time to work its way through the system.
- Weather remains a significant and unpredictable driver of the available slack within the northeast timber supply chain, and mills must plan for disruptions by keeping excess inventory buffers.

The regional industry is still in a tenuous situation, and there will certainly be additional challenges; however, stable pricing and demand during the second quarter has left us optimistic. In short, we believe the industry overall has acclimated to what has become the "new normal."

Pulpwood Products

We are now fully through the "feeding period" for our regional pulp mills – raw material inventories that were stockpiled in winter have been drawn down during the spring. Mills are

- ***U.S. imposes preliminary duties up to 24% on 'subsidized' Canadian softwood lumber*** (Apr 25th)
  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."
  — CBCNews

- ***Maine sawmill owners welcome Trump's tariff on Canadian softwood lumber*** (Apr 26th)
  Maine sawmill owners are welcoming the Trump administration's announcement that it is imposing stiff duties on imports of Canadian softwood lumber, intensifying a longstanding trade dispute with the United States' largest trading partner. The Commerce Department will impose duties of 3% to 24% on softwood 2-by-4s, planks and other lumber arriving from Canada.
  — Portland Press Herald

coming into July prepared to begin building up inventories again, with some reporting to be in better shape than others. The slow start to summer operations is likely some cause for concern among wood buyers, however the supply situation can change quickly. Production at our regional mills has remained steady and most have indicated a motivation to increase their output.

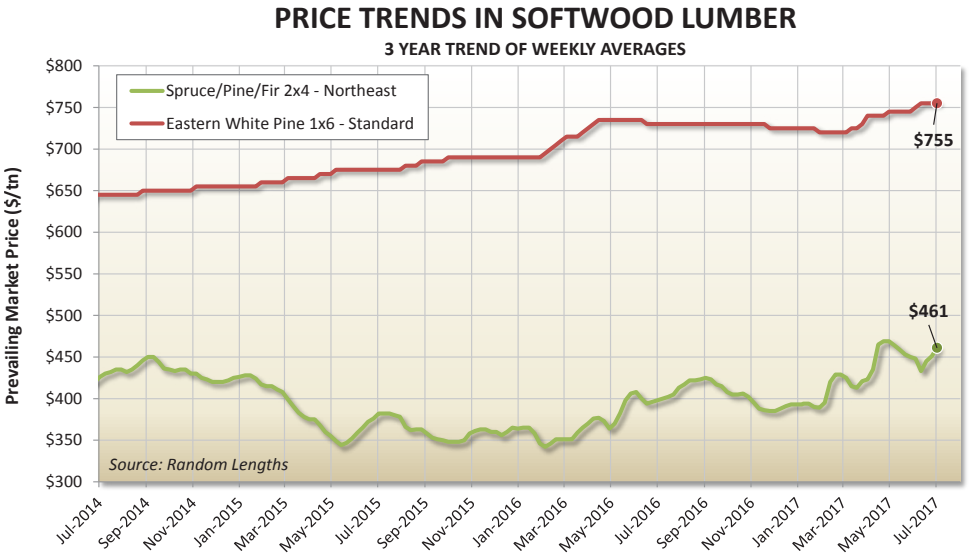
The widespread delivery restrictions that affected the free flow of wood to pulp mills last year have been lifted for the most part, although we believe quotas will continue to be a tool employed by mills in periods of excess supply. Where it is economically viable to sell, hardwood pulpwood is unrestricted at all facilities. Softwood pulpwood demand is limited and although we are able to sell all the softwood pulpwood we cut, we are intentionally adjusting our harvests to produce far less than we used to. There remain a significant number of acres in the remote areas of the northeast where softwood pulpwood cannot be harvested and transported for a positive return.

We continue to see some production substitution between softwood and hardwood kraft pulp, where mills capable of producing both products will occasionally respond to spot opportunities in their end-user market to temporarily change over from their traditional product. Because there are fewer consuming mills, the impact of these switches can be felt throughout the supply chain – creating a temporary glut of one product and a shortage of another. We expect this to continue as mills are pressured to remain flexible to demands of their customers.

Sawn Products

Softwood

Demand for softwood sawlogs continued apace during the second quarter, driven by sturdy pricing and a general positive outlook for lumber (see chart below). Because the lumber market has been strong throughout the last eight months, the regional dimension lumber sawmills have been ramping up production levels. For the most part, sawmills went into spring carrying decent inventories so as not to be forced to miss shifts or throttle back output. The tenor of the marketplace is generally enthusiastic and optimistic, and we have seen this play out through steady to slightly increased pricing for spruce and fir sawlogs.



There remains a general tightness in the market for softwood sawmill residuals – chips and sawdust. Sawmills rely on regional pulp mills as customers for these byproducts, and one unanticipated pulp mill shutdown can make sawmills uncomfortable quickly and cause ripples through the supply chain. Everyone feels it.

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- ***Trump orders review of national monuments, vows to 'end these abuses and return control to the people'*** (Apr 26th)
  President Trump signed an executive order instructing the Interior Secretary to review any national monument created since Jan. 1, 1996, that spans at least 100,000 acres in a move he said would "end another egregious use of government power." Referring to the 1906 law that empowers a president to take unilateral action to protect cultural, historic or natural resources on federal land that is under threats.
  — The Washington Post

- ***Sappi North America announced plans to invest $165 million in its Skowhegan mill.*** (May 2nd)
  Sappi Ltd. plans to spend $165 million on its No. 1 paper machine at its Skowhegan mill, which company officials said will increase the machine's overall capacity and ability to produce consumer packaging products by April 2018.
  — Bangor Daily News

- ***Shuttered Maine mill land one step closer to becoming an energy park*** (May 8th)
  EMEP LLC, a company that is seeking to build a $240 million biorefinery in East Millinocket, has reached a settlement with North American Recovery Management and expects to close within 60 days. Securing the land is the next key step for EMEP in pursuing its plans for a biorefinery that would make combustible fuels from wood using technology under development by the oil giant Shell.
  — Bangor Daily News

One largely awaited development in the lumber markets has been the imposition of trade restrictions on Canadian softwood lumber by the U.S. government. Petitioners for these restrictions have alleged that Canada unfairly subsidizes their industry by providing access to below-market timber from public lands. In April, a preliminary ruling by the U.S. Department of Commerce placed an anti-subsidy tariff on all imported lumber. For the mills within our regional market, this so-called "countervailing duty" rate was determined to be just shy of 20%. The Commerce Department followed in June with a finding that Canadian producers were "dumping" imports on the US – selling at below cost to flood the market – and placed additional anti-dumping duties at an average rate of 6.87%. At this point, the Canadian mills that we sell to are currently paying these taxes for every piece of lumber delivered to the U.S. These taxes, and the speculation trading which happened in the prior several quarters, have been a significant contributor to the surge in lumber prices.

Interestingly, we have not observed much of a direct link to spruce or fir log prices. Back as early as last September, we were interpreting different log buying strategies in the context of a potential trade dispute following the expiration of the Softwood Lumber Agreement. While the indexes we follow from *Random Lengths* reflect an approximate 18% increase in the price of lumber since January 1st, log prices are only marginally up. Despite some speculation buying, the dispute does not seem to have had a dramatic effect on short term log buying patterns.

In the long-term, however, the effect of this trade dispute will be damaging to the health of our regional industry if it is not resolved. As we have reported in past newsletters, we believe the series of sawmills directly across the border in Quebec, which represent a meaningful and historically important part of the regional forest products industry, are exceptions to the U.S. Department of Commerce findings. These mills have historically been able to demonstrate an absence of subsidy due to their location and lack of supply from public lands, and their unique circumstance has led to them having been specifically excluded from prior trade restrictions in the Softwood Lumber Agreement. We are convinced the situation has not changed.

Hardwood

Although there are some exceptions, in general hardwood sawlog prices are off where they were one year ago. This is primarily due to the region's dependence on hard maple as a staple product – hard maple lumber demand has fallen in the past year. The sawmills that we have talked to have suggested a mixed bag -- that lumber pricing has still not recovered to a point where they would like to see it, but that demand has picked up slightly and the product is moving better. We aren't expecting much change to hard maple sawlog pricing in the near term.

Overall, demand for the "white woods" – maples, birches, ash – were lower through the quarter. We are expecting lower demand in particular for white birch boltwood, which is used in turnings and for smaller items such as popsicle sticks. This market, which can sometimes outcompete grade logs, is seeing reduced regional consumption. That said, most of the material will easily be absorbed – at slightly lower returns – into the white birch sawlog market.

In the past six months we have seen more attention to foreign exports of hardwood sawlogs in our Maine region. This is a somewhat more common practice in other regions, but investments in building supply chains for export has increased demand for higher-end hardwood logs. Local logs are being placed in containers and shipped overseas to Europe and Asia. Some have said it is a currency-driven temporary spot market, but momentum for this market appears to be increasing which is likely to put additional pressure on our local sawmills.

- ***Canada considers retaliation against U.S. in escalating timber war*** (May 8th)
  The Canadian Prime Minister says he's carefully considering a request from the premier of British Columbia to deny U.S. coal exports through Vancouver. The ban would be a retaliation in the escalating trade war over softwood lumber. The Trump administration called Canada's threats inappropriate, and insisted they would have no effect on the U.S.'s course of action.
  — *Montana Public Radio*

- ***Tallest mass-timber building in U.S. receives approval for construction*** (Jun 6th)
  The Framework Project has received approval for a building permit, allowing construction to begin on the tallest wood high-rise structure in the US. The 12-story, 145 foot tall building will contain office space, street level retail, and sixty units of affordable housing. The permit was approved following a series of stringent fire, acoustic, and structural tests that validated the design meets fire life-safety standards.
  — *Architectural Record*

- ***Double certified forests on the rise, joint PEFC/FSC data report*** (Jun 14th)
  The two largest forest certification schemes, PEFC and FSC, have agreed to jointly collect and publish data on double certification, starting from 2016 onwards. 16% of all certified forests globally are double certified to both PEFC and FSC. PEFC and FSC therefore decided to work together to provide a more accurate and mutually agreed estimate for the total global certified area.
  — *Confederation of Timber Industries*

Biomass

The biomass market remains cold, in the face of abundant and inexpensive alternative fuel sources. Consumption is fairly light, and almost always sourced locally to the consuming facility. We are still producing a limited quantity in the woods, but it is limited to only those locations where it can be produced and transported economically. Much of the material that would traditionally be headed for the biomass market now heads back into the forest to provide ground cover.

Benjamin D. Carlisle
PRESIDENT

Future Technology and Forestry

by Sam Radcliffe, Vice President

I was at a neighborhood meeting recently where the guest speaker presented the regional planning commission's "Vision 2050" plan, a blueprint for land use and transportation systems for southeastern Wisconsin over the next approximately 30 years.[1] This seemed like a reasonable endeavor, but I wondered how the commission could possibly anticipate and plan for 2050 technology and all the social changes that technology would engender.

Two trends that are apparent today could "derail" the regional plan that calls for greater conventional transportation capacity. One, it seems widely expected that roads will be populated by driverless vehicles of all types. Two, it is likely that fewer vehicles will be required due to widespread telecommuting spurred by higher quality conferencing and collaboration tools. But what about on-demand mass transit?[2] How about flying cars?[3]

In terms of technology development, thirty years is an awfully long time. Think of technology in 1987: the PC is only 6 years old, still a text-based machine; there is no internet; the iPhone is 20 years away; telecommuting hardly exists; GIS, GPS and satellite imagery are in their infancy.

The fast pace of technology development makes such efforts as "Vision 2050" seem almost laughable. But guess what? As forest managers, we daily make judgements (at least implicitly) about not only the world in 2050, but also 2060, 2070, 2080 and beyond. We make silvicultural decisions that are aimed at growing species and products and creating a landscape for which we presume (assume? hope?) there will be some societal demand. And we certainly don't consider our jobs laughable! But in the day-to-day imperative to meet today's demands for forest products and sustainable forests, we rarely have the luxury of considering what the world will look like when today's silvicultural efforts come to fruition.

So it's useful to consider what technologies might be shaping forestry in the distant future. First, what products will be demanded from the forest? It's hard to resist the notion that today's conventional forest products will still be in demand for decades to come. The bulk of US timber harvest today goes toward the same products as in 1987 – paper, lumber, and panels (Figure 1).[4] The biggest change during that timeframe has been the substitution of composite panels (buried in Figure 1's "Pulpwood-Based Products") for plywood, primarily in residential construction. This has allowed the use of formerly underutilized species (often aspen) and lower-quality trees for structural products.

Forest product development seems to be continuing to move in the direction of composite or engineered materials. Two examples that we hear about today are cross-laminated timber (CLT) and nanocellulose.

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- ***Interior secretary sees potential for other uses of Katahdin national monument*** (Jun 15th) During a three day visit to Maine, the head of the Department of the Interior, Ryan Zinke said that federal ownership of Maine's Katahdin Woods and Waters National Monument is "settled" and suggested transitioning to a national park was still a possibility. Yet Zinke also touted opportunities for more public access and "traditional uses" - including timber harvesting - on the federal land, offering reasons for optimism to both monument supporters and opponents.
  — Portland Press Herald

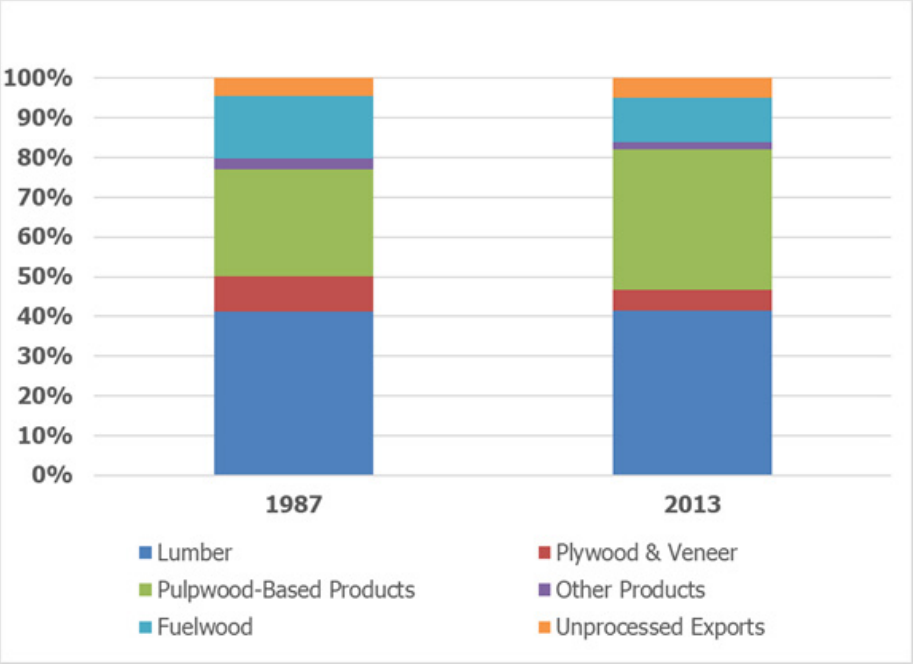

Figure 1. US Timber Production by End Product, 1987 & 2013

CLT is the backbone of the mass timber building movement. From APA – The Engineered Wood Association:[5]

Cross-laminated timber is a large-scale, prefabricated, solid engineered wood panel. Lightweight yet very strong, with superior acoustic, fire, seismic, and thermal performance, CLT is also fast and easy to install, generating almost no waste onsite. CLT offers design flexibility and low environmental impacts. For these reasons, cross-laminated timber is proving to be a highly advantageous alternative to conventional materials like concrete, masonry, or steel, especially in multi-family and commercial construction.

Recently the city of Portland, Oregon approved plans for a 12-story building, which will be the tallest hybrid timber structure in the US. Not far away, at the University of British Columbia the 18-story Brock Commons project will be completed this summer (Figure 2).

Nanocellulose is comprised of the submicroscopic particles that are the structural building blocks of trees and plants. Three types of nanocellulose are separated from conventional wood pulp using either chemical or mechanical processes.

Figure 2. The Brock Common Project at the University of British Columbia[6].

Applications include composites, batteries, super-capacitors, high-efficiency filters, reinforced polymers, bioplastics, coatings, sensors, flexible display, medical and industrial membranes, and many other high-end products.[8]

An interesting development is the use of nanocellulose as a substitute for carbon fiber in the "ink" for 3-D printing. Nanocellulose is as strong as carbon fiber but less expensive and more environmentally friendly. This most abundant polymer on earth could be a perfect match for the large scale 3-D printers which can currently produce objects up to 20 feet long, 8 feet wide and 6 feet tall.[9] In the future, entire houses may be 3-D printed on a mass scale.[10] What would that do to lumber demand?

Although nanocellulose may displace other wood-based products, it is expected to create large new demands for timber. Cowie et al[11] estimated that the high volume nanocellulose applications with near-term potential for commercialization will create a US demand of about 6 million metric tons (Figure 3). To put that in perspective, the same authors estimate that this volume of wood would require the annual output of 163,000 acres of natural forests. Assuming a 60-year rotation, that equates to 9.8 million acres that would need to be devoted to nanocellulose feedstock.

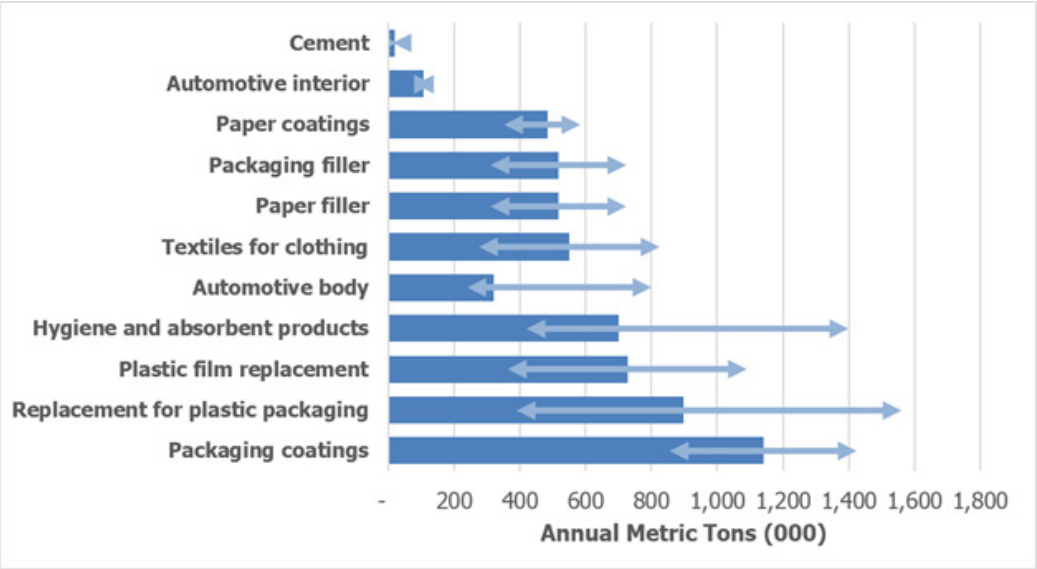

Figure 3. Projected US Demand and Demand Ranges for Nanocellulose in High-Volume Applications.

Of course one way to meet increased demand for timber is to grow trees faster. Just in the last 40 years there have been quantum leaps in timber yields due to improved genetics, primarily in loblolly pine. In the late 1970's we used to marvel at first generation improved loblolly yielding two cords per acre per year. In the future it is likely that optimized silvicultural systems and clonal forestry will produce yields exceeding five cords per acre per year.[12] Unfortunately, nearly all of this gain will occur in the South. Silvicultural and genetics research in the North is decades behind the South, and current northern research interests are rarely focused on timber productivity. Historically, the US forest products industry has tended to follow the supply of wood. To the extent that the South can continue to improve timber productivity relative to the North, we can expect future processing capacity (timber demand) to gravitate southward.

Although the North may not fully share the fruits of future genetic breakthroughs, advances in remote sensing and robotics may produce greater management efficiency gains in the North, where forests are generally more remote than in the South. It is not hard to imagine the use of drones in forest inventory – they are already commercially available for what might be called "extensive" inventory, where the goal is to develop estimates of biomass rather than the detailed species/product estimates that require boots on the ground to obtain. In the near future, advanced sensors will enable individual species differentiation[13], and the ground truthing for tree quality and volume measurements may be done by robots (Figure 4 and Figure 5). How about equipping those robots with the capability to make harvest decisions that optimize the balance between current income and future value growth (i.e. total return on investment)?

Getting timber to market is a process ripe for technological innovation, especially given the difficulty in attracting and retaining quality logging labor.[15] Agriculture is rapidly moving toward robotics for harvesting and crop monitoring.[17] Although the farm terrain and spatial distribution of crops present an easier problem than the forest, is it such a stretch to envision robotic timber harvesters and skidders (Figure 6)? Perhaps guided by individual tree RFID tags?

Figure 4. Atlas Robot by BostonDynamics Demonstrating Ability to Navigate in the Forest. [14]

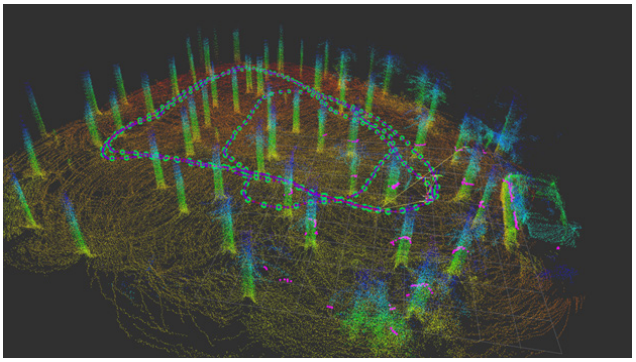

Figure 5. 3D Map of Forest Generated Using Simultaneous Localization and Mapping Together with Trajectory Where Robot Was Driving. [15]

These few examples just scratch the surface of what might be possible in 30 years. New forestry applications will grow out of technologies such as augmented reality and artificial intelligence. The possibilities are limited only by our imagination, but one thing is for sure: we are still dealing with a bulky, low value product that takes decades to "manufacture". Any cost efficiencies to be gained through technology will be more than welcome.

Figure 6. A Prototype Robotic Tree-to-Tree Felling Machine Under Development under New Zeland's Primary Growth Partnership. [18]

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