Building a Thermal Argument

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Dear Members and Friends,

Major changes are sweeping through New England’s forests. Some present new challenges for forest landowners who wish to practice exemplary forestry, and others offer new opportunities to conserve productive forestland and secure forests’ vast ecological values. In this newsletter, Eric Kingsley documents the rapid decline in demand for low-grade forest products due to the collapse of both the biomass electricity generation and the manufacturing of pulp and paper in Maine. These market changes reduce landowners’ options for managing their forests for high-value timber. Kingsley offers his expert analysis, and also provides a hopeful perspective on the future of New England’s forest products industry.

You will also read about Harvard Graduate School of Design students who are constructing and testing engineered wood buildings at our Prouty Woods headquarters. These visionary architects are exploring the attributes of different New England tree species for use in new engineered wood products. Their work is part of a movement that could pave the way for more wood construction, and renewed demand for New England forest products. Finally, we take you to Maine to touch base with one of our partners, the Downeast Lakes Land Trust. We are happy to report they are thriving, and were recently able to expand their land protection by selling carbon credits on their existing forestland.

The theme here is seizing opportunity in the face of challenges and changes. These challenges compel us to intensify our efforts to create new markets and keep forestry relevant in the 21st century—and that is exactly what we are working towards.

We hope you enjoy your copy of Into the Woods. Together, we can help ensure that New England remains productive and forested for future generations.

Robert Perschel
Executive Director
“There is something fundamentally interesting about doing an architectural thesis project and having to leave architecture school to do it.”

—JACOB MANS, HARVARD GRADUATE SCHOOL OF DESIGN STUDENT

The whir of a table saw, the pounding of a hammer, and the roar of a blowtorch—these are the sounds of Harvard graduate students playing hooky in the woods. Starting in the spring of 2016, a group of students from Harvard’s Graduate School of Design have been cutting, nailing, and assembling large, thick panels of wood to construct one-room, full-scale building models near the trailhead of NEFF’s Prouty Woods Community Forest. The students are testing the thermal performance of different species of wood in an effort to change the way the construction industry thinks about and uses wood in mass timber construction.

Jacob Mans, one of three Harvard students collaborating on the project, lights a small outdoor wood stove on the construction site as he passionately describes the project. “The big idea behind our thesis is that you can’t just talk about wood as a single homogeneous thing,” Mans explains. “A lot of architects are talking about...
For Mans and his colleagues, wood is more than just a building material; it is an opportunity to build responsibly and sustainably with a natural, renewable resource. Through their work, the team wants to make building with wood as sustainable and as local as possible.

“There are all of these really interesting species, and there are all of these great reasons to use them in buildings, but still everybody is just talking about softwood,” Mans says. “It just doesn’t make any sense to build out of a single species on the east coast, especially out of all softwood, because we have a mixed hardwood forest.”

In an effort to challenge the industry standard, Mans, David Kennedy, and Benjamin Peek, Harvard students and founders of the research-based design firm Decentralized Design Lab, are constructing what they refer to as a ‘thermal argument.’

In general, the team explains, denser wood retains heat for a longer period of time. The group is testing the thermal properties of different species by constructing three ‘huts’ using engineered wood, also known as mass timber construction. Each panel is made with a different combination of white pine, spruce, black locust, black birch, hemlock, black ash, and beech, many of which are not typically used in mass timber.

The design team assembles the solid-wood panels on the construction site with standard shop tools, nailing and doweling strips of lumber together into panels that are up to three-and-a-half inches thick, ten feet long, and four feet wide. The panels are then used to construct the floor and walls of the huts, with each hut requiring roughly four thousand board feet of lumber.

Each of the three huts will be rigged with thermal sensors inside and outside the walls. The researchers will heat the buildings, and then track how

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Above: Sean Mahoney of Mass DCR and David Kennedy and Jacob Mans of Decentralized Design Lab use a portable saw mill to cut boards from a red maple log harvested on Prouty Woods.
the different types of wood respond to the heating and cooling process. Through this experiment, Decentralized Design Lab may be able to build an argument for using a wider array of tree species in mass timber construction.

Mans explains what they are trying to accomplish using a familiar example. “In the southwest, people build out of adobe and mud because you can store a lot of heat in really dense materials. They take all of the sunlight that is pouring down all day long, and the energy never makes it inside the structure. We’re trying to do the same thing, but in reverse. Instead of having the heat on the outside and not letting it get into the building, we are trying to heat the inside, and have it return back into the environment after the heater turns off.”

Decentralized Design Lab is already collecting results. “We have stayed over here for several nights when it has been really, really cold,” Peek says. “We turn our heater off, and it’s still a pretty great experience. You touch the wall, and the wall is warm, radiating heat back out to you. It is doing everything that we hoped it would.”

Over the next year, the team will continue to collect thermal data from sensors and cameras, creating a year-long profile of heating and cooling cycles. But the research isn’t the only outcome of the project. “We have people who walk by here every day,” Mans says, “They want to go inside the hut, they want to see what it’s like, they want to climb up into the loft—you don’t get that with a scaled model project. Until you build full-scale, you don’t get that human experience, and you don’t realize everything that it could be.”

Working on NEFF’s Prouty Woods has also given the students an opportunity to strengthen connections between architecture and forestry. “Chris Pryor, NEFF’s Director of Forest Stewardship, was saying that we should be thinking about red maple,” Mans explains, “it’s a really aggressive species, there’s lots of it, it’s hard to get high quality wood out of it, and it doesn’t pay to get it out of the woods.” Through their conversation with Pryor, the design team realized that red maple could be a good candidate for mass timber construction because the panels do not require high quality, graded lumber. In addition, red maple is a dense wood. Mans explains, “If we were to use red maple, we would have a panel system that might perform thermally better than a solid pine panel, because it can store more energy.”

To test their theory, the team joined NEFF and Sean Mahoney from Massachusetts Department of Conservation and Recreation (DCR) to harvest and mill red maple trees on Prouty Woods. Over the course of three days, NEFF, DCR, and Decentralized Design Lab are making data that will help them determine the potential of red maple for mass timber construction.
Design Lab worked together to harvest red maple, skid the logs out of the woods and to a portable sawmill, and mill the logs into boards that will be used to construct the third and final hut.

While the team defended their thesis in May, the research and the various benefits of the project will continue well after Mans, Kennedy, and Peek graduate. The huts will remain near the trailhead of Prouty Woods, and NEFF will be able to use them for educational events and demonstrations.

For Decentralized Design Lab, the huts are just the beginning. “As a group, we want to continue this work in some capacity,” Mans says. “That is why we set up the collaborative called Decentralized Design Lab. The idea is that whether each of us is teaching or working, we can all continue to collaborate and pool our projects and research into a single group.”

Mans, Kennedy, and Peek’s work couldn’t be coming at a more pivotal time for mass timber construction. “Building with wood is blowing up,” Mans says. “You’re seeing more and more wood buildings over the last five years, and you’re going to see more and more of it in the next five to ten years.” There is a revolution in wood construction, and through work like the Harvard students’ thesis project, the revolution will strengthen the ties between the forest, the forest industry, and the buildings from which people work and live.

Visit NEFF’s blog, builditwithwood.org, to learn about mass timber construction and what NEFF is doing to support the movement.

To find out more about Decentralized Design Lab, visit decentralizeddesignlab.com.
“We think of it as a very special place... a very special place for all sorts of reasons. A lot of people have a certain amount of unexplained attachment to it.”

—KYLE BURDICK, DOWNEAST LAKES LAND TRUST

Nearly 15 years ago, the Downeast Lakes Forestry Partnership led to the successful conservation of 339,000 acres in Downeast Maine. The project was designed to address the social and economic needs of the Downeast region while achieving far-reaching conservation goals. As a part of the partnership, NEFF acquired sustainable forestry easements on approximately 339,000 acres of land, 270,80 acres of which were purchased by Downeast Lakes Land Trust (DLLT) as part of the Farm Cove Community Forest. Today, Farm Cove has grown to 33,708 acres and is a working example of community-led forestry. With the pending acquisition of the adjacent 22,000-acre West Grand Lake Community Forest, DLLT is preparing to apply the community forestry model to a land base of more than 55,000 acres. NEFF’s Land Protection Manager, Betsy Cook, interviewed DLLT’s Executive Director, David Montague, and the Community Forest Manager, Kyle Burdick, to find out more about Farm Cove and the challenges and opportunities of the community forestry model.

Q: What are the overarching goals of Downeast Lakes Land Trust?

David Montague: In broad terms, the overall goals are to manage fish and wildlife habitat, provide public access for recreation, and provide a steady stream of timber products. A large part of the land trusts’ goal is to keep things the way they have always been. That’s what a lot of people wanted. They didn’t want change, they didn’t want anything to happen, and it was what they were accustomed to. But we would like to go beyond that, and specifically manage for wildlife. For example, we have gone through a lot of efforts to improve fish passage issues on the property.

Q: How do you balance the Trust’s multiple, and at times potentially conflicting, goals?

Montague: Anytime you are managing a single land base for multiple uses and multiple objectives, there’s the high likelihood that those uses will conflict, causing friction. We have recreational hiking trails and campsites that could be negatively impacted by heavy active forest management in close proximity. So whenever we are planning out a timber harvest or habitat restoration work, we think about how different uses will be impacted by the planned management activity.

Our goal is to create a diverse forest for a diverse range of uses. We have early-successional areas managed for young forest and late-succession areas managed for old forest. We have an extensive network of roads, ATV trails, and snowmobile trails, but we also have 3,500 acres of ecological reserve in which motorized access is limited. Our multi-use approach doesn’t mean that every part of the forest is managed for every activity; it means that there is a place on the community forest for each person to enjoy the forests and lakes in their own way.

Q: Have there been times when timber harvesting has caused conflict with recreation?

Montague: There has always been a lot of community involvement in the governance of the Trust, but there have been some missteps over the years where management activities did cause some upset within the community. I think that those have been learning experiences that have informed our activities, and the goal is that we don’t repeat those mistakes. Often it comes down to outreach, and stepping up our outreach efforts before, during, and after the management activity. A large part of outreach is collecting community feedback and educating our community.

Q: Farm Cove Community Forest operates under a community forestry model. Can you describe how it informs your management?

Montague: Community forestry is really kind of a democratic process, beholden and responsive to the community. That really only works when that community is up to speed, informed, and educated about the type of forestry and the type of management that you are trying to achieve. We use our education and outreach program to help expand local knowledge about natural history and science-based resource management, and in turn we rely on the community for knowledge and expertise about the past and present condition of the forest, the wildlife, and the things that people value most on the landscape. It’s a two-way street.

We have a forestry committee that is made up of community members and subject matter experts, including foresters, loggers, guides, and biologists.
We also have a fish and wildlife focused sub-committee, which basically grew out of the forestry committee because it is such a big topic in itself. Both of those committees try to involve as many people as possible. We also have a trails committee that handles oversight of all of our recreational facilities—trails and campsites and that kind of thing.

Q: Can you describe the current management of Farm Cove?

Kyle Burdick: We have a long-term time frame in mind when making management decisions, because we see this as a long-term project and a community forest that will be here in perpetuity under single management. We’ve taken on several grouse and woodcock early successional habitat projects, and used timber harvesting as a means to achieve those. In a recent inventory and stand analysis, it appears that our birch and aspen stands are diminishing—they are actually shrinking in acreage. We would like to keep those around.

Q: Are there any examples of external factors impacting your management, such as markets, invasive pests, or climate change?

Burdick: Hemlock is a good example of all three of those things impacting the same resource. Currently, we do not have a hemlock pulp market, and hemlock pulp used to be our “meat and potatoes” for volume of products removed in order to do good, sound silviculture and forest management. So that is going to prove difficult to manage in the future. We also have hemlock woolly adelgid making its way up the coast, and our hemlock-dominated forest may be susceptible to that.

Financially, not having a hemlock market means we have to adjust our allowable harvest to not overharvest the other species. We can’t just take the same volume we have been harvesting for the past 10 plus years, and then just throw it all at hardwood, spruce and pine. We are going to be looking at a reduced income if we can’t find a solution. Creative marketing for hemlock, whether it is biomass or some other kind of product, might become useful for us. Hemlock has been our biggest challenge facing external forces.

Q: How have you tried to mitigate the effects of those external forces?

Burdick: In addition to trying to find other markets [for hemlock], we have also expanded into a carbon market, which has provided a significant amount of income initially, and then will provide periodic income as we go forward. Should we harvest less in the future, we theoretically will get more carbon credits. This is a diversified management approach that will probably work pretty well.

Hemlock markets will prove difficult to navigate in the coming years, and we will need to figure out a strategy to cope with that. That could have many implications, although we would like to continue with business as usual, if at all possible. If the hemlock woolly adelgid does come and remove a significant portion of the hemlock, it might provide some dead woody material habitat, which is part of what we already wanted to do as a part of the management plan. We typically try not to work against nature—we try to work with it.

Q: Outside of outreach and participation in community forestry committees, what are some of the ways that you connect with community members?

Montague: We have a firewood permit program, where people can harvest up to 4 cords of firewood per year off community forests for free. We also have craft wood permits for local artists and craftsmen. Most notably, we have canoe builders in town who make use of the permit as a way to harvest ash and cedar for canoe building. And then we have our educational programming as well, which has really grown and developed over the life of the Trust and the community forest. It is sort of treating the community forest as a laboratory and a classroom.

Q: If you could capture the essence of your management of Farm Cove in one sentence, what would you say?

Montague: We try to keep the forest forest, and keep it open and available for the enjoyment of everyone.
SHIFTING MARKETS: CHALLENGE OR OPPORTUNITY?

New England’s low-grade wood markets are rapidly declining, and mill closures are making headlines. NEFF asked Eric Kingsley of Innovative Natural Resource Solutions LLC to report on this issue to find out what shifting markets could mean for landowners and forest management. In the following article, Kingsley sheds light on the opportunities and challenges that face landowners and the forest products industry throughout New England.

WRITING BY Eric Kingsley
PHOTOGRAPHY BY Kari Post
In a region with an abundance of low-grade wood in the forest, wood typically used for pulpwood or biomass energy, we are quickly losing markets. In the last two-and-a-half years, New England has lost markets for almost four million tons of wood. Put into visual terms, this represents markets for over 350 truckloads of wood every day, all year.

Almost all of the lost markets have been in Maine, and pulp mills represent the lion’s share of the loss. Pulp mills in East Millinocket and Bucksport have been closed and dismantled. In Lincoln, Old Town, and soon to be Madison, mills sit idle, with little expectation that they will ever operate again. Biomass electric plants in West Enfield and Jonesboro closed after losing access to valuable operating incentives provided through the Massachusetts Renewable Energy Portfolio Standard.

Of course, it’s not all bad news. While the industry is going through some structural changes, new investments and business strategies are allowing remaining mills to position themselves for the future. In Woodland, an investment of $150 million is bringing tissue manufacturing to that location, transitioning the mill away from its historic “pulp only” status. The mill in Rumford, now owned by Catalyst, has turned the flexibility of its paper machines into an asset, and is looking to produce paper that best fits its customers’ needs.

While mill closures and new investments grab the headlines, the critical question of “What does this mean for the forests and forestry in the region?” often doesn’t get enough attention.

Markets for low-grade wood are important for a number of reasons, and the loss of so many markets—so quickly—will impact landowners, loggers, and forest management options throughout New England.

First, it’s a hit to the wallet. For many landowners, this isn’t brutal. Most family forest owners make their money selling sawlogs for lumber, not pulpwood and biomass. For example, recently in New Hampshire, low-grade wood represented 74% of the volume harvested statewide, but only 8% of the timber price was paid to landowners. Of course, for loggers and truckers further down the supply chain, this loss of volume means loss of revenue and opportunity.

More importantly to the landowner, the loss of markets is a loss of options. Foresters often tell me that markets represent “tools in a toolbox.” Having a toolbox with fewer tools means fewer forest management opportunities. Markets for low-grade wood provide opportunities for the harvest of lesser-quality trees, allowing the remaining higher quality trees to grow more rapidly and achieve a higher value as sawlogs.

While changing and shrinking markets will impact all of New England, the greatest impact will be to specific, local areas. While a mill may be located in Maine, pulpwood comes from every New England state and from nearby Canadian provinces. With some mills now gone, the remaining mills are able to get more of their wood closer to their operation. This is good for a number of reasons, but a challenge for those on the economic edge of supply to a facility. Distant wood is expensive wood, and gets cut off from supply chains first. Landowners in southern New England, parts of Vermont and New Hampshire, and Maine’s Penobscot River valley may find themselves scrambling to access markets that were reliable just a year ago.

Mills also use specific species, and the recent round of mill closures and reductions has hit softwoods particularly hard. Landowners with an abundance of pine, hemlock, spruce, and fir pulpwood may find themselves with limited markets. When markets for softwood pulpwood are available, landowners should recognize that they won’t be getting paid what they would have a few short years ago.

Dramatic market changes can be disconcerting, but they aren’t the end of the world. In many parts of New England, a range of markets—sawmills, pulp and paper mills, energy facilities, and more—are available to landowners. They have changed, and will continue to shift over time. What is important is landowners, foresters, and loggers utilize those markets that are accessible to continue practicing forestry, and the forests continue to grow a range of species and products. The forest industry and the region are full of entrepreneurs, and the loss of markets should provide opportunities for new ventures to be pursued, and new products developed that fit the resource and the market.
Chamberlain Reynolds Memorial Forest is one of the most popular public access areas in the Squam Lakes Region. John Wister of Swarthmore, Pennsylvania donated the forestland to NEFF in 1953, naming the property for his friends, Allen Chamberlain and Harris Reynolds who were both NEFF supporters and officers. The property retains a feeling of remoteness and seclusion, with its backdrop of huge pines, expansive views of Squam Lake, and distant mountains. Nearly a mile of lake frontage provides critical nesting area for loons.

Chamberlain Reynolds is an excellent example of private non-profit organizations working together to maintain a managed forest and natural area. The Squam Lake Association (SLA) maintains over four miles of gentle hiking trails through the forest, and has constructed a bird observation boardwalk through the wetland area. Dogs are welcome, but must be on a leash at all times. The SLA maintains five campsites on the edge of Squam Lake, four of which are accessible by trail, and one that can only be accessed by water.
Over the past 60 years, Chamberlain Reynolds Memorial Forest has provided wildlife habitat, recreational opportunities, and an abundance of forest products and local jobs.

Since 1953, NEFF’s management has increased the volume of wood in the forest, while also generating over 1.2 million board feet of timber and 522 cords of wood—enough to build 22 average single-family homes and produce more than 46 million sheets of printer paper. Chamberlain Reynolds Memorial Forest is a testament to the ability of New England’s forests to provide a wide array of benefits, from recreation and wildlife habitat to forest products and local jobs.

Trail maps and reservations for camping can be obtained by contacting SLA.

squamlakes.org

603-968-7336
Generous support from the individuals and organizations listed below has allowed us to continue and expand our efforts to conserve the forest landscape and the environmental, social, and economic benefits it supports. Your contributions are greatly appreciated and are vital to our success. While we have listed gifts of $100 or more, we want you to know that every gift is important to us and helps us fulfill our mission.

“The clean, new look of 'Into the Woods' certainly snatched my attention, and the new logo is striking. May the successes towards NEFF’S conservation goal and landowner initiatives quickly prove the benefits of a sharper, cleaner image”
— GORDON RUSSELL, RUSSELL FARM AND FOREST FOUNDATION
Founded in 1944, NEFF pursues innovative programs to advance conservation and forestry throughout New England. With the help of donors and supporters, NEFF has conserved more than 1.1 million acres of forest, including one out of every three acres of forestland protected in New England since 1999. Our work takes talented staff members, well-coordinated volunteers, and generous supporters. Your annual support and gifts enable us to care for the region’s forests.

We hope you will consider making New England Forestry Foundation a part of your legacy. Through tools such as charitable trusts, you can make a gift that supports New England Forestry Foundation while providing you with lifetime income, or providing benefits to family members. A wide variety of assets such as land or securities can be included in legacy gifts.

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