Build It With Wood: The Green Carbon Pump
Interim Report on Progress
October 30, 2015

By Emily Kingston, Frank Lowenstein, Bob Perschel and Alec Giffen
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Cover, clockwise from top left: Forté Apartments, Melbourne, Australia (Photo credit: Lend Lease); The Framework Project, Portland, Oregon (Photo credit: LEVER Architecture); LifeCycle Tower One, Dornbirn, Austria (Photo credit: CREE); Federal Center South Building 1202, Seattle, Washington (Photo credit: Benjamin Benschneider); The University of British Columbia’s Earth Sciences Building, Vancouver, British Columbia, Canada (Photo credit: Martin Tessler); Richmond Olympic Oval, Richmond, British Columbia, Canada (Photo credit: Fast + EPP); Finnsforest Modular Office (FMO) Building, Tuulikuja, Finland (Photo credit: City of Helsinki).

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### List of Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AWC</td>
<td>American Wood Council</td>
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<td>CLT</td>
<td>Cross-laminated timber</td>
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<td>FSC</td>
<td>Forest Stewardship Council</td>
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<td>Glulam</td>
<td>Glued laminated timber</td>
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<td>IBC</td>
<td>International Building Code</td>
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<td>ICC</td>
<td>International Code Council</td>
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<td>LEED</td>
<td>Leadership in Energy and Environmental Design</td>
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<td>NEFF</td>
<td>New England Forestry Foundation</td>
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<td>PSL</td>
<td>Parallel strand lumber</td>
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<td>USDA</td>
<td>U.S. Department of Agriculture</td>
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<td>USGBC</td>
<td>U.S. Green Building Council</td>
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1. Executive Summary

This report presents the initial results of New England Forestry Foundation’s Build It With Wood (BIWW) program, launched in March 2015. BIWW aims to encourage the use of wood construction in New England and potentially nationwide, with the goal of encouraging high-quality forest management and use in the region. By encouraging greater sustainable wood use we believe we can sustain rural economies and jobs in New England, improve forest health, expand forest conservation, improve urban building stocks and costs, and improve the global climate benefits of forest cover in the region.

One peer reviewed study suggests that enhanced wood construction constrained by the sustainable yield of global forests could eliminate or offset 14% to 31% of global CO2 emissions [1]. This would represent a significant contribution to solving global climate change with few to no detrimental effects on lifestyle choices or economic activity.

Because New England brings together 1) globally influential audiences through the strong universities and financial sector of the region, 2) the most heavily forested region of the country, 3) three of the four most densely populated states of the country with associated abundant construction opportunities, 4) existing public concern about climate change and demonstrated willingness to address that through public policy, and 5) an existing diversified forest products sector supporting 30,000 jobs there is a strong opportunity to advance wood construction globally via work in the region.

This report presents the results of stakeholder interviews, public opinion research, multi-stakeholder planning, and scientific research planning. It lays out actions for the future in the realms of communications, financial and market analysis, scientific research, and multistakeholder partnerships.
2. Introduction

As articulated in our 2014 report, *The Path to Sustainability*, and in the technical research reports underlying that report, New England Forestry Foundation (NEFF) believes greater use of wood construction can benefit the people of New England and the nation. Specifically, NEFF believes that if executed properly, greater use of wood construction can provide:

- enhanced economic opportunity for the rural regions of New England,
- lowered cost of construction for critically needed urban and rural buildings,
- stronger incentives for forest conservation and exemplary management,
- improved forest health, and
- substantial benefits in addressing global climate change.

Achieving these benefits will require a broad, multi-year, multi-disciplinary effort, as the future of wood as a building material is shaped by many diverse disciplines and trends. The knowledge and practices of foresters, timber products manufacturers, engineers, architects, developers, government officials, and the institutions commissioning new buildings all affect the ability of New England to seize these benefits. As the most heavily forested region of the country, with ongoing economic growth driving new construction, and strong political will toward abating climate change, New England Forestry Foundation believes New England can and should take a leadership role that could resonate to affect national and even global policy and action.

This report presents the results of 41 in-depth interviews conducted by New England Forestry Foundation between April and July 2015 with exactly the influential stakeholders identified above. The goal of these interviews was to identify current understanding of the wood building opportunity among stakeholders, and particularly to identify barriers and opportunities that need to be addressed in order to move wood construction forward. This report is intended to complement an analysis of public attitudes toward wood buildings conducted by the polling firm FM3 and a scientific analysis of the climate benefits to be conducted in partnership with the Clean Air Task Force and the Woods Hole Research Center. This report also offers an introductory vision, strategic direction, and approach for future action by NEFF and partners.
The rise of industrialism in the 19th century brought with it the beginning of multi-story buildings of ten stories or more. Steel and concrete became the primary building material for the increasingly tall structures. To this day, the word ‘skyscraper’ evokes an image of structures of dizzying heights composed of steel frames, glass exteriors, and concrete panels.

While steel and concrete have been the primary building material for over a century, wood has also been going through an industrial revolution which makes it a desirable building material for the 21st century. The wood revolution began in the 1990s with new engineered wood products and massive timber building products, such as cross-laminated timber (CLT), glued laminated timber (glulam), and parallel strand lumber (PSL). These new wood products are composed of multiple panels of lumber bonded together with strong adhesive glues. Each board of engineered wood produced is designed to optimize the naturally strong properties of the wood. The end results are beams and panels of wood that are lighter than steel, yet have load bearing capacities that allow them to substitute for steel or concrete supports in many applications.

Wood grows naturally, is a renewable resource, and provides many environmental and economic benefits while it’s growing. Wood harvesting and processing have been important in the economy of rural portions of New England since colonial times, and remain so today.

With the advent of global climate change and the potential economic, environmental and humanitarian damage it is expected to cause, there are new reasons to promote the use of wood. Wood construction can abate the extent of global climate change in two ways. First, the manufacture of steel and concrete are very energy intensive processes—requiring heating of the raw materials to high temperatures, as well as mining and transporting heavy raw materials. Timber is typically produced with much lower energy inputs, and thus most studies conclude that wood construction has a lower “embodied carbon” than steel or concrete construction. That is, less carbon dioxide is released to the atmosphere during the creation of a wood structure than an equivalent steel or concrete structure.

In addition, as a tree grows, it absorbs carbon dioxide and releases oxygen through photosynthesis. This carbon accumulates within the wood where it remains safely stored in the
fibers for as long as the wood exists. If the tree is harvested and used in wood construction, much of that carbon can remain out of the atmosphere for decades to centuries.

Thus, use of wood construction provides the potential for both reduced emissions and carbon sequestration. A complex web of factors affect the extent of these benefits and will be addressed in Section 5.6 below.


3.1 Project Introduction

NEFF aims to serve as a regional convener in the growing movement toward building more with wood through our program Build It With Wood: The Green Carbon Pump. Launched in early 2015, Build It With Wood aims to encourage greater use of wood, and particularly New England wood, in regional construction.

NEFF began its Build It With Wood initiative by first undertaking a four part feasibility investigation. This includes:

- Communication- understanding public attitudes and how to communicate about wood construction, and devising an approach for advancing wood construction with the public and key decision-makers.
- Science- understanding the full climate benefits of greater wood use in construction—including effects of harvesting.
- Policy- exploring stakeholder understanding of the barriers and opportunities for wood buildings via interviews with urban government officials, major construction executives, architects, engineers, wood products companies, academics, and state agency officials.
- Finance- defining the scope and goals for a future study of investment in advanced wood products in New England.

We conducted 41 informational interviews to gain expert perspective, accumulate knowledge of the sector and identify opportunities and obstacles. The findings are summarized below. Our next step was to convene a select group of stakeholders in Portland, Maine to consider the findings.
and partner with us to develop a vision, set of goals, strategic direction, and plan of action to encourage the use of sustainable wood in New England buildings. The outcomes of that planning meeting are presented in Section 7. NEFF also hosted the panel event “Sustainable Development Benefits of Building with Wood” as part of Climate Week NYC which is discussed in Section 8.

3.2 Interviews

Interviews were based on a standard set of questions and attempted to clarify respondent’s opinions regarding the opportunities and/or obstacles to building with wood, as well as their sense of crucial knowledge gaps and critical players. Interviewees were drawn from a variety of industries, organizations, and sectors (Figure 1). These included, but were not limited to:

- U.S.D.A. Forest Service
- Colleges and universities
- Architecture and engineering firms and organizations
- Engineered wood producers
- Forest resources firms
- Fire safety and other code officers
- City and state government officials
- Large construction firms
- Building developers
- Forest conservationists

Figure 1: The general industries of the 41 interviewees.
4. Results and Findings

Through the interviews, we identified a series of potential opportunities and obstacles currently at play in the New England region. In the lists below those identified with italics are addressed more fully in Section 5.

Opportunities for wood construction include:

- Interest and generally positive impressions on the part of architects and engineers interviewed.
- Cost advantages of wood construction.
- Abundant wood resources in New England.
- Regulatory and policy efforts to reduce New England’s and the United States’ carbon footprint.
- Concentration in New England of institutional actors likely to be interested in innovative or distinctive structures (e.g. colleges and universities, hospitals, corporate headquarters).
- LEED standards that encourage use of renewable materials and local resources.
- Changes in the International Building Code that allow taller wood buildings.
- Groundbreaking wood buildings including the (Integrated) Design Building at UMass-Amherst, and the buildings to be constructed through USDA Forest Service’s Tall Wood Buildings competition.
- Speed of construction of some engineered wood applications once approval is obtained.

Obstacles to wood construction identified include:

- Limited experience throughout the construction industry with wood construction other than for single-family residential construction.
- Potential political issues, particularly with unions that may favor one type or another of construction.
- Acceptance of wood construction through the reduction of recurring concerns from end-users and/or the entities commissioning wood buildings.
- Absence of local or even any US-based sources for engineered wood products such as cross-laminated timber.
• *Suitability or lack thereof of New England woods for both traditional and engineered wood construction.*

• *Current limitations on the height of wood buildings, along with the high cost of land in prime locations such as downtown Boston. The high cost of land more or less mandates multistory construction to enable economic feasibility.*

• *Increased costs associated with lack of experience working with wood. Developers seeking to use wood construction for large commercial or institutional projects should expect increased costs for project design and approval.*

• *Ease of use of wood within architectural and engineering software particularly Building Information Modeling (BIM) systems.*

5. Details on Certain Opportunities and Obstacles

5.1 Green Buildings and LEED Certification (Opportunity)

Construction of green buildings has surged in recent years. 41% of all non-residential buildings in 2012 were considered green, up significantly compared to 2% of all non-residential buildings in 2005\(^1\). A large component to green buildings is earning a certification from a reputable green building rating system. For example, the number of projects which are receiving Leadership in Energy and Environmental Design (LEED) certification has steadily grown over the past decade (Figure 2). Some cities, such as Boston, now mandate the new construction be LEED certified. Article 37 of the municipal zoning code in Boston requires that all large-scale development projects must meet the USGBC LEED certification standards. Enacted in 2007, Boston became the first major municipality to require such requirements. In the U.S., Massachusetts is now among the top 5 areas with the greatest per capita investment in green buildings in 2014 [2].
The largest driving factor behind the green building market growth has most recently been attributed to a strong market demand [2]. Market demand being the driving factor is a significant shift from what was reported previous years. While it is now considered a business imperative to build green, the top driving factor in 2008 was “doing the right thing.” [4] This implies that the demand for green buildings will continue to grow in the near future with the market demand.

Green buildings practices have helped increase the popularity of timber products. Green buildings, which are environmentally responsible and resource-efficient, can utilize the natural properties of wood and reduce the building’s overall impact. Credits awarded for using wood vary between green building rating systems. LEED, the rating system for green buildings managed under the U.S. Green Building Council (USGBC), included credit for wood building materials in versions LEED 2009 and LEED v4. The Certified Wood Credit in LEED provides incentive to building project teams to use wood building materials certified by the Forest

“We thought it was kind of a joke when it started, but it has absolutely taken over.”
President of construction firm, in reference to green buildings
Stewardship Council (FSC). LEED standards encourage the use of low carbon, renewable and locally-sourced materials, parameters that will match with use of New England FSC certified wood.

Certain industry sectors have high viability to increase the number of green buildings. The three industry sectors with the highest penetration of green building are education, health care, and commercial/office [2]. This echoes the sectors that were identified in our interviews as having the greatest potential interest in wood construction.

5.2 Building Codes (Opportunity and Obstacle)

A code change proposed by the American Wood Council (AWC) to expand the use of CLT as part of the heavy timber classification was approved by the International Code Council (ICC) and was fully adopted for the 2015 International Building Code (IBC). This change increases the opportunities available for building designers to use engineered wood products, once the changes to the International Building Code are embodied in local codes here in the United States. Cross-laminated timber can be used safely to construct buildings of up 15 stories height, as has been demonstrated through projects in Canada, Australia and several European countries.

Currently in most of the United States, building codes restrict the possible heights for wood buildings to 5 stories and the process to change the code takes multiple years. It was stated by one individual during the interviews that, “…the limitations for wood are probably derived from code, fundamentally.” Changing building codes to accept taller wood buildings would be a direct solution to one of wood’s current constraints, but will take multiple years to achieve.

Fire codes and fire safety in wood buildings were also brought up during the interviews. All buildings, regardless of building material, have to be safe during use and occupation. Should a fire occur, fire safety includes evacuation of occupants, safety of emergency operations from the fire, and structural stability. In the unlikely case of a fire, it is important to understand the variations in performance for timber products. Much like the differences between kindling and thick logs, light timber and heavy timber perform in different ways when exposed to fire [5]. Light timber, as seen in stick frame built construction typical of single-family residential
applications, does not resist fire through development of a char layer as occurs with heavy timber. When exposed to fire, the outer layer of heavy timbers burns and chars, protecting the inner layer, which remains intact and retains structural strength (Figure 3). Research on the charring of heavy timber is both well understood and predictable. Fire safety for wood buildings may also include modern sprinkler systems, fire alert and detection systems, and fire retardant coverings over some wood components.

Figure 3: The layers produced when wood is exposed to fire for an extended period of time [6].

The perception of risk may be improved by increased understanding of fire performance of timber and reasonable regulations. Wood does not react in the same manner as steel and concrete during a fire. Each material should be managed differently based on current knowledge and research. All buildings should consider the best combination of systems to reduce the risk of a fire starting and the methods to safely evacuate an occupied building during an emergency.

5.3 Architectural and Engineering Training (Opportunity and Obstacle)
Architects and engineers were consistently identified as likely to be supportive of using more wood in buildings. While architects and engineers have the ability to increase the interest in
wood buildings through the designs they present to their clients, there is a lack of sufficient knowledge and resources among those groups today. According to the interviewees, there is a dearth of college courses and educational options addressing how to use wood for architectural and engineering students in the United States. This contrasts the educational system in Europe where architecture and engineering students are exposed to wood earlier and more often. It should be noticed that organizations, such as WoodWorks, are working to fill those gaps in knowledge and provide the education and resources needed to build with wood. WoodWorks was established by the Wood Products Council and provides free technical support and educational resources with the focus on non-residential and multi-family wood buildings.

Currently, U.S. firms are forced to outsource portions of the building design process. For instance, the University of Massachusetts Amherst hired Vancouver-based firm Equilibrium Consulting as the structural design engineers for the wood-centric (Integrated) Design Building that is now under construction.

5.4 A Global Effort to Build With Wood (Opportunity)

Throughout the world, other organizations and individuals are thinking about wood construction as well. While the methods may vary, the messages remain largely the same; wood products can be and should be used more frequently in construction of buildings, including tall rise buildings. Some examples of other programs and projects include:

“Unless you have a personal bent toward wood during university, you’re not going to be exposed to wood. This is the first failing.”
Employee for engineered wood product producing company

“Through providing training for the architects and engineers and increasing of support, the knowledge base will influence the demand. Influencing others is more cost effective than buying carbon.”
Director of a U.S. Forest Service program
• WoodWorks- An initiative of the Wood Products Council which provides free project assistance, education, and resources related to the design of non-residential and multi-family wood buildings.

• Wood for Good- A wood promotion campaign in the UK. It aims to promote the suitability and sustainability of wood as a building material to the construction and logistic sectors and associated professionals such as architects and design engineers.

• U.S.D.A.- Created the U.S. Tall Wood Building Prize Competition in 2014 and challenge architects, engineers, and developers to “showcase the architectural and commercial viability of advanced wood products like Cross Laminated Timber (CLT) in tall buildings.”

• Oregon Forest Resources Institute- In 2009, published the special report “Building To Benefit the Environment: The Role of Oregon Wood Products in the Green Building Movement” which outlined the potential synergies between the state’s green building and forest sectors.

• Dovetail Partners- Published multiple reports regarding green buildings and building with wood, including the 2015 report “Building with Wood: Proactive Climate Protection.”

• Forest Climate Working Group- A coalition of multiple organizations recently published “Expanding the Use of Wood in Buildings—Including Tall Wood Buildings—Helps to Support Climate Preparedness and Mitigation.”

• The Innovative Wood Products Collaborative- Supports the use of wood from sustainably managed forests in tall buildings and other commercial structures.

• Make It Wood- Do Your World Some Good- Australian program which aims to encourage the increased use of responsibly sourced wood as a building material.

Many of the buildings that showcase wood’s potential, particularly in height, are located outside of the U.S. For example, London is home to the nine-story Murray Grove residential building, Australia currently boasts the ten-story Forté Building which is the world’s tallest timber apartment building, and a 14-story wooden luxury apartment building is underway in Norway. British Columbia has the Richmond Olympic Oval with a glulam wood roof as well as the eight-story Wood Innovation and Design Center.
The reason behind the international acceptance of wood is likely related to education. Architects and engineers knowledgeable in wood’s structural abilities have the opportunity to present wood as an alternative to steel and concrete. As the demand for wood buildings increases in U.S., so will the demand for additional educational opportunities and wood-specific resources. Until then, those looking to build with wood in the U.S. will continue to look internationally for inspiration and assistance.

5.5 Cost Comparison (Opportunity)

Cost comparisons between wood-centric buildings and steel and concrete buildings are not definitive. The cost fluctuates significantly after considering where the product is sourced from, the height of the building, and design features for the structure. One of the biggest advantages that engineered wood products have over steel and concrete framed buildings is shorter construction time. A project that is prefabricated allows for simultaneous construction as opposed to linear construction, resulting in a shorter on-site construction time [7]. For example, Murray Grove was erected by 4 crewmen in 27 working days over 9 weeks [8]. Rapid construction also leaves the surrounding neighborhood less disrupted. While the cost of materials for a wood structure in U.S. is currently not at a substantially competitive level versus other construction materials, the time and labor saved is often significant, resulting in competitive total construction costs.

5.6 The Complexities of Climate Benefits (Opportunity and Obstacle)

The carbon benefits of wood often arise when discussing building with wood. A recent article by Yale professor Chad Oliver and colleagues documents that substituting wood for "People don’t understand carbon is stored in trees. The story is too complex. It’s one too many steps for the public."

Senior Director of forest conservation organization
concrete in construction worldwide could produce a 14% to 31% reduction in global carbon emissions [1]. But the significance of this unique benefit that wood offers is largely ignored outside of the building and construction industries. Even Andrew Waugh, one of the architects involved in London’s Murray Grove, stated that “…when we sat [the developer] down and we explained to him the environmental and sustainable benefits of building this building with timber, he said, ‘The thing is, Andrew, I don’t [care about] the environment. I’m not interested. You’re going to have to sell this to me in a completely different way.’ So we sold it to him on the basis of speed, and efficiency, and cost.” [9]

The public focus groups NEFF commissioned delivered a similar perspective. When presented with three rationales for supporting the Green Carbon Pump, participants frequently ranked “Reducing climate change” last and said that it lacked urgency compared to increasing the supply of housing and conservation of forests. Participants largely did not understand how climate change works and subsequently were uncertain about the connection between climate change and forests. This suggests that while the carbon emissions reduction and sequestration benefits exist, they will be a primary selling point to convert or convince individuals about the why building with wood is desirable only in limited cases where that is the individual in question’s primary interest.

But the multiple benefits of wood construction, mean that we can use the other benefits to sell wood construction, while delivering important climate mitigation benefits as well.

Key factors that influence the climate advantages of building with wood include:

- our ability to maintain carbon stocking on forest lands while sustainably harvesting wood from them (potentially offering a new lens for conceiving of sustainable forestry),
- our ability to harvest wood from forest lands in ways that maximize the overall climate benefits of harvest, taking into account other factors such as albedo, volatile organic carbon emissions from trees, and impacts on evapotranspiration (see Section 9.2),
- how the embodied carbon footprint of steel and concrete changes over time with improved emphasis on sustainability in those industries,
• the success of efforts to minimize waste and energy consumption during all phases of wood harvest, processing and use, and
• building in a way that promotes long-lived wood structures and enables the eventual reuse or recycling of those structures.

5.7 The Potential of New England Forests (Opportunity)
The forests of New England weren’t always as healthy, extensive or as well-managed as they are today. As settlers became established in the region, there were significant changes to the land. Forests were converted to farmlands, which were later abandoned for more fertile lands farther away (Figure 4). After centuries of heavy use, New England forests recovered and regrew. New England is now the nation’s most forested region with 33 million forests acres of 42 million total acres [10]. However, two trends offer both hope and concern for the future of New England forests. After decades of increasing forest cover, each New England state is now declining in forest acreage. Also, although modern scientific forest management techniques are available, they have not been applied consistently across the landscape due to landowner patterns and attitudes and economic markets for forest products.

There is the potential for New England forests to yield more products while still maintaining the ecological values of the landscape and assisting in the mitigation of climate change. NEFF’s

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Grow More Wood report indicates that the current harvesting rate for wood could double for an additional 12.6-16.8 million cords of wood without negative ecological impacts [11].

Potentially these additional products could be grown and harvested to service an increased demand for structural and engineered timbers in multi-story buildings. In this future, the region would realize an increase in forest based jobs, a revitalization of rural economies, an economic incentive to increase the quality of management and to maintain forest acreage in the face of development pressure, and key steps in the mitigation of climate change.

5.8 New England Tree Species (Opportunity)

New England forests are composed of a mix of tree species including aspen, birch, oak, pine, spruce, fir, and maple (Figure 5). Each species varies in how suited the timber would be for conversion into engineered wood products. Hemlock, for example, easily splits between the annual rings and is not ideal for CLT. White ash is vulnerable to emerald ash borers, an Asian beetle that feeds on ash species. Other species are at risk for diseases and infestations.

“I think there’s a great potential, especially for spruce up in Maine. Why not shift from what had been the paper industry in Maine, popping up all that spruce to use it for cross-laminated timbers because that’s what they’re building with in Austria: spruce. To me, I think that’s perfect, really.”

Executive Director of university’s forestry program

This does not mean that the wood cannot be used. Cross-laminated timber presents a new opportunity for wood that might be damaged in certain sections by combining smaller pieces. A project manager from an open spaces and forest conservation group in the Pacific Northwest stated that lots of wood has been recently damaged by fire and boring beetles, but was still converted to CLT products.
Figure 5: The major forest types of New England [12].

In order to best utilize the different New England tree species for structural lumber, the individual properties must be researched and understood. We spoke with researchers who stress, bend, and break wood in order to develop the strongest and lightest structural wood products using New England species. Wood can be reoriented and combined in numerous ways to
produce new products. The quality and properties of each species differ and more research is needed in order to incorporate local New England species into large wood structures.

6. Discussion

In concluding the initial stage of understanding, NEFF has learned:

- Building heights between 4 and 10 stories should be a primary focus for wood buildings moving forward. While current New England building codes do not support wood buildings above 5 stories, examples of international buildings support the case for taller wood buildings and help familiarize people with wood as a structural material.
- There are climate benefits, which we need to promote in a clear and concise way.
- We need to ensure that codes and policy support taller wood buildings than are currently accepted under the codes.
- Cost of wood buildings is key to acceptance and we need to prove and communicate how the economics add up.
- Communication and public relations are key- NEFF can play a vital role by organizing stakeholders, aligning our efforts and creating a buzz of interest, expectation and encouragement.

7. Portland Planning Meeting

7.1 Desired Outcome and Objectives

As a next step, NEFF convened the first Build It With Wood: The Green Carbon Pump Planning Meeting in Portland, Maine on September 2, 2015. The group’s desired outcome was development of a plan of action for how the Build It With Wood: The Green Carbon Pump Partnership will advance greater use of wood in buildings.

The meeting began with a “Setting the Context” session during which Bob Perschel, Executive Director at NEFF, presented an overview of The Path to Sustainability report developed in 2014 with emphasis on the results around building with wood. Frank Lowenstein and Emily Kingston, NEFF, also provided overviews of the focus groups and interviews with key stakeholders to further explore the efficacy of the Build It With Wood concept. Finally, Marc Rivard, © New England Forestry Foundation 2015. CONFIDENTIAL. NOT FOR ATTRIBUTION OR CIRCULATION 21
WoodWorks, shared an overview of his organization’s efforts to reach out to and engage architects and engineers regarding the use of wood in buildings.

Figure 6: Participants discussing the results of a brainstorming session at the Build It With Wood: The Green Carbon Pump planning meeting in Portland, Maine.

Attendees at the planning meeting were:

- Joe Chaissone, Clean Air Task Force
- Paul De Morgan, RESOLVE
- Jean-Marc Dubois, Nordic Structures
- Alec Giffen, NEFF
- Yugon Kim, I-K-Design
- Eric Kingsley, Innovative Natural Resource Solutions
- Emily Kingston, NEFF
- Jonathan Lewis, Clean Air Task Force
- Frank Lowenstein, NEFF
- Alan Organschi, Yale School of Architecture
- Marc Rivard, WoodWorks
- Carlton Owen, US Endowment for Forestry and Communities
- Bob Perschel, NEFF
- Charlie Reinertsen, NEFF
- Pat Strauch, Maine Forest Products Council
- Mary Tyrrell, Yale School of Forestry
- Barbara Vickery, The Nature Conservancy
7.2 Developing a Vision and Identifying Activities to Achieve the Vision

Building on the overviews and presentations, the group began to formulate a vision for Build It With Wood and deliberating on activities to achieve the vision. Much like the informational interviews, the group of participants were varied in their specialty and knowledge. This resulted in an array of topics being discussed and considered.

After the initial discussion, the group spent time individually identifying the range of activities that could be explored to ensure a Build It With Wood Partnership would have an impact on the issue. The group then shared all of these ideas and organized the activities into broad themes or areas as follows:

- Regional Economic Value (Rural/Urban)
- Policy
- Education (Professional)
- Public Messaging
- Regional Demonstration

7.2.1 Regional Economic Value (Rural/Urban)

Economic value was focused largely on the opportunities within regional commercial timber industries and their manufacturing capabilities. This included discussion of the lack of engineered wood products manufacturers within the region and the need for an investigation of the financial prospects for such industries to be created in New England. Additional research and knowledge is recommended in order to articulate the potential demand, including what skills are needed for producing engineered wood products, analyze the scope of the market, and assess that market relative to the costs of building an engineered wood plant.

7.2.2 Policy

Policy can play a role in several aspects of Build It With Wood, including providing incentives for wood construction or engineered products manufacturing, and promoting efforts to allow taller wood buildings under building codes. Other regions are already doing this type of policy work. For example, Senators and Congressmen from Oregon announced in summer 2015 that Oregon and Southwest Washington received a manufacturing designation under the Investing in Manufacturing Communities Partnership focused on advanced wood products and cross...
laminated timber. Approximately $1 billion from federal agencies will become available to support manufacturing strategies. Engaging groups of political leaders in promoting wood construction could directly influence policies, opportunities, and codes.

A policy systems change requires long-term planning, coalition building and action. One specific initiative recommended for inclusion is the development of a regional effort supporting national initiatives to update building codes in favor of wood construction.

7.2.3 Education (Professional)
As discussed in Section 5.3, professional education is an integral component to supporting the creation of wood buildings. Innovation and design begin to suffer when architects and engineers are not exposed to building knowledge about wood and timber, as is common in U.S. college and post-graduate curricula today. Continuing education of existing architects and engineers is necessary but also well-covered by WoodWorks.

7.2.4 Public Messaging
It is known from the public focus groups that the public is largely misinformed and disinterested in both climate change and building with wood. A connection between the public, wood construction, and regional forests needs to be established to garner public support. A key is to make the connection of wood construction with forest conservation and management. Perceived forest health was incredibly important to the public and can be expanded upon with the proper outreach and education. Building on the local agriculture movement to create a “local wood” movement would allow the manufacturing story to be told, from forest to lumber to product. This could help build demand for local forest products.

7.2.5 Regional Demonstration
In order to highlight what can be achieved when building with wood, it is worth targeting wood buildings that are 5-10 stories and promoting the benefits. Since buildings that model wood innovation are currently rare in New England, the first success stories will be from other U.S. regions and international. There are existing wood buildings in the region (and more planned)
creating the opportunity to complement taller buildings from other regions with local examples such as the Portland Jetport and the Berkshire East Ski Lodge.

Organizations concerned about their public profile, such as hospitals and universities, may be more interested in producing wood buildings. Examples include the Seattle-based Bullitt Foundation producing the Bullitt Center and the UMass Amherst Integrated Design building now under construction. These flagship wood buildings act as project demonstrations for outstanding green building design and may be used as a teaching tool to educate others. Creating and promoting the benefits of wood buildings using a regional portfolio of flagship wood buildings will help bring focus to the Build It With Wood effort.

7.3 Action Items and Next Steps
At the conclusion of the meeting, NEFF indicated it was willing to take the next step of articulating what a campaign or program might look like moving forward. Other members of the Planning Group indicated they would be willing to review the product and share perspectives and/or identify opportunities to engage in the future. Specific actions Planning Group members would potentially be willing to assist with included:

- Helping to think through the policy arena
- Providing insights from producers upstream
- Developing competitions
- Drawing attention to Boston Society of Architects work on wood buildings
- Exploring opportunities for students
- Establishing a Yale School of Architecture/School of Natural Resources project on local wood uses
- Helping guide analysis of the potential of New England tree species, building on experience marketing wood products
- Exploring “pathway transition” or transformation as a way to build demand
- Helping create better understanding of the current technologies, materials, and opportunities
- Creating “local wood” incentives and marketing
• Defining how CLT is used and the other products available and how they are used
• Developing purchasing preferences for government entities

Ultimately the group agreed with the idea of moving from an opportunistic approach to an organized, concerted multi-organizational one.

8. Climate Week New York City Panel Event

8.1 Sustainable Development Benefits of Building with Wood

On opening night of Climate Week New York City 2015, panelists at the “Sustainable Development Benefits of Building with Wood” event looked to our nation’s forests for innovative climate solutions. Organized by NEFF, the Global Institute of Sustainable Forestry at the Yale School of Forestry & Environmental Studies, and the Sustainability Practice Network, the panel considered how wood construction could play a revolutionary role in reducing the extent of future climate change.

The event took place as part of the seventh annual Climate Week which is organized by the international non-profit The Climate Group. The Climate Group aims to address climate change issues and global greenhouse gas emissions through solutions compatible with economic growth. Over 100 events encouraging climate change discussion, awareness, and action were hosted by community groups, universities, NGOs, and companies from around the world during Climate Week this September.

8.2 Panelists

Panelists included leaders in architecture, green building engineering, and forest conservation. The panel consisted of:

• Michael Deane (moderator)- Chief Sustainability Officer, Turner Construction
• Michael Green- Principal, Michael Green Architecture
• Patrick Holmes- Senior Advisor to the Under Secretary, Natural Resources and Environment, USDA
• Frank Lowenstein- Deputy Director, NEFF, and Senior Fellow, US Department of State Energy and Climate Partnership of the Americas
• Chad Oliver- Pinchot Professor of Forestry and Environmental Studies, and Director of Yale's Global Institute of Sustainable Forestry
• Bill Parsons- National Director, Architectural & Engineering Solutions, WoodWorks
• Roger Platt- President, U.S. Green Building Council

8.3 Panel Discussion
The open-dialog discussion began with Vancouver-based architect Michael Green who is known for his designs of wooden skyscrapers. In his opening statement, Green began by showing a rendering of the 102-story tall Empire State Building made of steel cables surrounded by wood panels. He followed by listing some recognizable examples of tall wood buildings and emphasized the importance of more wood buildings, not just tall wood buildings. Green concluded with the winners from the international wood design TREEHOUSING competition at the World Forestry Congress.

“It’s absolutely technically possible, but we have to shift society’s perception of what’s possible because we haven’t seen a new way to build a skyscraper before this in the past 100 years. It’s tough to change the construction industry, but it is happening.”
Michael Green, MGA

Following Green was Frank Lowenstein who highlighted the economic and environmental aspects of increased use of wood in buildings along with the benefits of active forest management. Lowenstein proposed a radical idea to maximize the carbon benefits of forests by harvesting them sustainably, improve their health while doing so, and to store the carbon embedded in the wood in long-lasting buildings.

Dr. Chad Oliver then continued the conversation on forest management. He discussed the carbon emission benefits of avoiding steel and concrete, along with how to protect the biodiversity of
forest ecosystems, articulating significant quantitative reductions in greenhouse gas emissions achievable through wood construction.

Patrick Holmes then highlighted the recent announcement of the winners for the US Department of Agriculture’s 2015 Tall Wood Building competition, a mixed-use building in Portland, Oregon and a residential condominium in New York City. Emphasizing the importance of maintaining forest products markets, Holmes argued that building with wood combats economic challenges through innovation.

Bill Parsons reviewed current building codes allowing for wood buildings in U.S. He mentioned that creating mid-rise wood buildings is well within current code and building tall is only one component to wood buildings.

Roger Platt concluded the panelist presentations with talk about LEED certifications and life-cycle analysis of building materials. He discussed issues with sourcing materials long distances away from the site and the significance of regulation during manufacturing.

After opening the floor for questions from the audience, the panel further discussed sustainable forestry, land protection, and energy efficiency of buildings.

9. Recommended Next Steps and Actions

As a result of these explorations and discussions to date—including the public focus groups, the extensive informational interviews, discussions during the Portland planning meeting, and the Climate Week panel event--NEFF’s Build It With Wood initiative is in position to build the momentum and support. NEFF’s recommended next steps and actions include focusing on communications including digital media and video, developing scientific research efforts, building a stakeholder steering group, and considering a market analysis for engineered wood products production.

“There are lots of applications that don’t require you to build the biggest building you can imagine.”
Bill Parsons, WoodWorks
9.1 Develop a communications campaign incorporating multiple audiences, media platforms, messages, and approaches

- Design and develop the website www.builditwithwood.com devoted to the Build It With Wood project, publications, news articles, and examples of current and future wood buildings. (IN PROGRESS)
- Identify a suite of “Flagship Buildings” for different categories, such as multifamily residential, low-rise commercial, mid-rise commercial, educational, etc. Possible entrants include: Portland Jetport, New Haven school, UMass Integrated Design building, Berkshire East lodge.
- Develop a web-based presence for these flagship buildings that includes identifying currently empty niches. Over time, build the website to include Flagship Buildings in each category in each New England state and to identify Ambassadors—articulate spokespeople for each building’s significance and features who could be featured in short videos on the web site.
- Develop a documentary film on the process and benefits of wood construction, using the NYC winner of the USFS competition and the New Haven School as central focal points of the documentary.
- Use the website, the flagship buildings and the documentary as foundational elements of a regional communications campaign for wood buildings.
- As elements of the campaign, consider both a New England wood buildings competition and formal curricula for architecture and engineering courses at the undergraduate and graduate school level.
- All of the above activities should be led by a multi-stakeholder partnership that includes groups like those represented at the Portland planning meeting plus unions and civic leaders.
9.2 Develop a research proposal to more precisely articulate the scientific gaps

- NEFF, Woods Hole Research Center and the Clean Air Task Force have collaborated to prepare a science research proposal to document the climate impacts and benefits of different wood harvesting regimes and differing uses of the resulting wood fiber (construction, biomass energy, pulp and paper, etc.). The proposal focuses on two case studies-- Northeastern forests and the much simpler to model pinyon-juniper forests of the Southwest. NEFF is supporting these two partners in seeking funding to launch this scientific research project.

9.3 Develop a regional multi-stakeholder steering group for Build It With Wood

- Convene a call of participants from the Portland Planning Meeting plus key participants and groups from the NYC forum to discuss priority actions and roles to advance the Build It With Wood initiative. The call would also consider whether to formally form a steering committee for the effort and whether this group itself becomes that steering committee. (IN PROGRESS)
- Invite additional participants to participate in the steering committee depending on areas selected for action.
- Form teams to develop the plan of work for the communications effort, to provide input on the science work, and to develop objectives and methods of operation of the steering committee.
- Convene a second call for late November to discuss outputs from the teams, particularly as regards communications and function of the steering committee, and evaluate the need for a larger stakeholder dialogue meeting.
- Continue monthly steering committee calls (brief, efficient) and execute the communications and science plans; pull together larger stakeholder dialogue for spring 2016 if decided by the group.
9.4 Consider developing a financial and market analysis for engineered wood products production here in New England

- Convene meeting with forestry experts (e.g. Pat Strauch) and a consulting economics company or nonprofit (e.g. AIER) to discuss approaches to evaluate the market for engineered wood products in New England, the suitability of New England forest products for use in such engineered wood, and the costs of mill development.
- Execute such an analysis.
10. References


