

The State of Forests and Forestry in the Androscoggin Valley-Mahoosuc region

A Report of the Northern Forest Investment Initiative

Biomass Energy Resource Center • Coastal Enterprises, Inc. • Forest Guild •
Manomet Center for Conservation Sciences • Northern Forest Center • Trust for
Public Land • Community Forest Collaborative

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Executive Summary

Sustainable forestry and healthy forests are at the heart of the natural resource-based economies and rural communities of the Androscoggin Valley-Mahoosuc region of western Maine and northern New Hampshire. Forests, forestry, and the forest products industry are integral to the vitality of the region. However, the region is experiencing significant change: changes in land ownership, unpredictable wood product markets, the global economic downturn of 2009, numerous mill closures, and the opening of a biomass-electric powerplant in the heart of the region. This report combines scientific and economic data with local perspectives to help articulate the challenges and opportunities facing the region's forests. In 2012-2013, over 30 people that live and work in the region were interviewed and their perspectives melded with forest and industry data to paint the picture presented in this report.

The changes in land ownership and wood products markets have altered the region's ability to sustain itself. Since the departure of the industry giants, there has been a marked change in land ownership with some parcels changing hands multiple times, with the total exchanged acres exceeding the number of acres in the region. This trend, combined with shifts to overseas wood products markets, has exacerbated the disconnect between communities and management of the forest. Furthermore, a weakened economy creates conditions for additional stress on the environment. The balance of wood products markets, landowner motivations, and long-term perspectives determines the state of the forest landscape. When a complex of social and economic pressure is at play, standards for sustainable forestry may be compromised. This ultimately may undermine the intrinsic hardiness of the region's forests and rural communities.

The data show that the region is capable of growing high-quality, high-value sawtimber in addition to the pulp for which it is famous, and there is an opportunity for this valuable wood to be harvested and processed for the highest and best use of the material. However, this opportunity has yet to be fully realized. The legacy of the pulp forest mentality remains evident. The region as a whole may be growing the quantity, but not necessarily the quality in a balance of age and product classes required to sustain local communities. If only young forests are continually regenerated, then the region will primarily grow pulp and biomass and will not be able to sustain sawmills. A diversity of mills and economic opportunities is dependent upon a diversified forest.

There is a noticeable imbalance of tree growth and harvesting across the region. Private owners, who own the majority of the region's forests, are cutting roughly twice as much wood as is growing each year. Data show a 2011 harvest rate of 0.74 cords per acre per year across the region, double the growth rate of 0.37 cords per acres per year. Harvest this much in excess of growth is commonly considered unsustainable if it continues over the long-term. These figures warrant closer scrutiny of recent and future growth and harvest volumes on private and public lands across the region.

Public lands exhibit the ability to grow a valuable forest resource, but may lack the management capacity to provide this value to the region. While private lands have been producing high volumes of pulpwood, publicly-owned lands have been growing a significant amount of top-quality, high-value sawlogs. For instance, data show that 57 percent of the total Grade 1 (16 inches DBH or greater) hardwood sawlog removals in the State of New Hampshire are contributed by this federal ownership. The White Mountain National Forest is practicing exemplary silviculture that benefits the forest-based economy and communities of the region. However, the Forest has been offering less than half of its allocated Allowable Sale Quantity, and this downhill trend is expected to continue.

Opportunities exist to improve the state of the forests in the Androscoggin Valley-Mahoosuc Region. A popular saying goes “Local wood does local good.” Indeed, growing, processing, and consuming wood locally greatly simplifies the complexities in the wood supply chain. Transportation costs are diminished, local jobs benefit, and the multiplier effect increases the local economic benefit. With fewer tensions at play, the forest may be treated less roughly, benefiting the ecological integrity of the system and helping ensure its long-term viability. Additionally, within this region, working forest conservation easements have grown in popularity as a mechanism for ensuring sustainable management of the working forest landscape. Community forests have also demonstrated success in positively impacting the state of forests and local communities. Fundamentally, a vibrant forest-based economy is dependent upon a sustainably managed forest resource, strong markets for a diversity of wood products, and communities that value their natural assets.

Despite a mixed management history, the region’s forests and people have demonstrated resiliency and the potential to adapt to challenging current and future conditions. However, both forests and communities are suffering in the process. This report is intended to provide a basis for the larger and crucial conversations needed to achieve a brighter and bigger vision for the region. An opportunity for the Androscoggin Valley-Mahoosuc region is to create a vision of a future forest that maximizes the potential of the forest resource to support local communities and ecosystems over the long term.

The following quotes capture the diversity of voices and issues highlighted in this report.

“I think the disassociation of lands from mills has led to a lot of the worst fears of people, meaning that when you had an integrated ownership structure between mill owner owning land, they had an incentive not to cut themselves out of a job.”

“In New Hampshire, the average land tenure or ownership is 6 years. That doesn’t leave you a lot of time to do much.”

“Short-term economic return. I think everything we have seen over the last 20 years is tied to return.”

“The increase in conservation easements and ownerships in this region does influence the broader landscape. Conservation lands are setting up our landscape for providing forest values long-term.”

“If you want to see well-managed forest, it has to come from the guy who owns the land, and there has to be an incentive for him to hang onto it from when he has small trees up to when he has big trees. Economically, to go out and buy any of that land today, to invest in that land without a housing project on it, looking to the day when you’ll have mature trees there and a sustained deal, you need change in economics.”

“It really relates back to your core values. Some of us are in there because of our core values, natural resource management. We could have made more money going somewhere else. If it’s the wrong thing, the forester needs to tell the landowner that it’s the wrong thing to do. There are foresters out there that will never tell them.”

“What’s always stuck with me is one, how resilient the forests are, and two, how markets seem to actually adapt to what we have, not what we have has to adapt to the market. We have this great forest that’s so diverse - diverse species, diverse products – and I think

there's a realization even in the investment side of things that diversity in a forest is a good thing, too."

"What's going to be the infrastructure? We are seeing in the state of New Hampshire, 50% of the white pine sawmills have gone out of business in the last 10 years. If you ask them why they went out of business, they say that the last time they cut the woodlot was the last time they were going to cut it because it was going to be developed. I think the same thing is happening in the hardwood industry. The attitude is, if you don't have that manufacturing facility, why grow it?"

"For a healthy forest economy, you have to have mills, and when times are tough, mills can go out quickly if people don't understand that and are just looking for top dollar."

"The industry's changed. Usually the cycles are up and down. This last one, we've been down for way longer than usual. Wood is harder to get. Trees are smaller. Veneer, when I started, was 14 inches; Today, it's 10. More timber is taken out of production. It's harder to get the resource here."

"There's a question of productive capacity. Mills seem to be hanging on, but how much longer? The mills will eventually close. Industry is in a tough situation. It puts silviculture in a tough situation, without having a market for low-grade wood."

"This area has been historically long both in the lumber business and in wood-turning. That's pretty well gone away now. We've really seen a shift from a forest products town to a service town."

"People aren't going to work in this area for those \$5/hr service jobs. They need secondary wood manufacturing or something. If you want to talk about the best value you can add, you buy pulp in at \$50/ton, and you sell it at \$800/ton. That industry added some value, and we've just seen it disappear."

"You need a generation to take over after you're gone. I look at my workforce, my loggers. Some of them are older than I am. I think there are two divisions; one is a logging force that's say 45-60 who know how to cut wood. And we now have a work force that's 20-30 that know how to drive equipment and listen to XM. They back up, they grab the grapple, and they take off. There's that disconnect, and we're going to see it in the future."

"The biggest export we have from the North Country is our youth. Many of us that are living here have done so because of what it's like living here, and we have willingly given up much better opportunities for financial gain."

"In order to impact wood products markets, we need to focus on economic development linked to local wood products. Single projects have to do everything – provide habitat, jobs, economy, development, a local component, and backyard or hunting and fishing. If we identify landowners that are part of a local wood basket and interested in conservation, we create a win-win for everybody."

"Everybody's got that get-by attitude, and you have to sometimes, but you can't do it forever."

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Introduction

In 2009, the Northern Forest Center launched the Investment Zone Initiative with funding from the U.S. Endowment for Forestry & Communities. Through this ambitious initiative, the Center leads and coordinates projects with partner organizations to increase private investment, develop use of community-scale biomass, advance innovation in wood-product manufacturing, encourage community forest ownership, and help landowners realize economic return for the environmental services their land provides. Core partners in the initiative include the Biomass Energy Resource Center at the Vermont Energy Investment Corporation, Coastal Enterprises, Inc., the Community Forest Collaborative, the Forest Guild, Manomet Center for Conservation Sciences, the Northern Forest Center, and the Trust for Public Land. In 2011, the partnership purposefully concentrated its efforts in the Androscoggin Valley-Mahoosuc region of western Maine and northern New Hampshire. It is difficult to draw an exact delineation around where residents feel is “home,” just as it is difficult to agree on a single name for the region (e.g. “Greater Coös Region” or “North Country”). Figure 1 below depicts a rectangle outlining the extent of the forest inventory data analysis, which encapsulates the footprint of the Mahoosuc Initiative. The broader region in which interviews took place includes Coös County, New Hampshire, locally known as “above the Notch;” portions of Oxford, Franklin, and Androscoggin Counties in western Maine; and portions of Vermont’s Northeast Kingdom and adjacent communities in Quebec, Canada. This mountainous, wooded landscape, defines residents’ sense of place, and the economic well-being and resilient character of rural communities are intimately tied to the state of the forest.

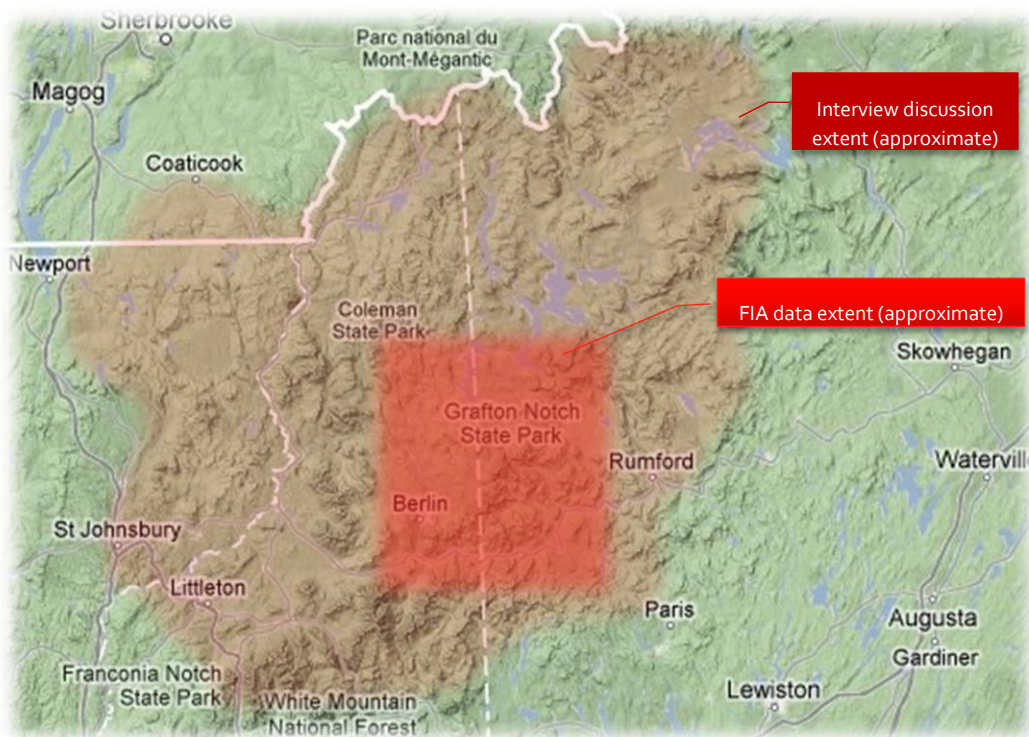


Figure 1 Regions of Interest

The 600,000-acre Androscoggin Valley-Mahoosuc region includes the towns of Berlin, Gorham, Shelburne, Milan, and Errol, New Hampshire, Bethel and Newry in Maine, and surrounding unorganized townships dominated by managed forest. The rectangle indicates the approximate extent of the FIA data examined for this report.

Boundaries cannot be accurately drawn around the extent of the economic woodbasket and where residents feel is “home in the North Country.” The broader region shares ecological, economic, and sociodemographic characteristics with this core area of interest.

To paint a more true-to-life picture of the state of forests and forestry, this report integrates economic and biometric data with interviews with over 30 people who live and work in the region. Interviewees included foresters, wood products manufacturers, wildlife biologists, municipal planners, land trusts, regional

conservation organizations, community leaders, and other individuals. Conversations explored themes of silvicultural trends, programs and practices, growth and harvest rates, pressures on the region and the forest industry, biomass markets, land ownership trends, and the potential for new programs or developments to impact the region. Based on this input and on the experience of Northern Forest Investment Initiative partners in the region, this report outlines fundamental challenges and opportunities to improve the state of the forests, forest-based economies, and rural communities in the Androscoggin Valley-Mahoosuc region.

Forests

Land Ownership

In a landscape dominated by private landholdings, the ownership of forest land in the Northeast and in the Androscoggin Valley-Mahoosuc region has changed significantly in recent decades. Across the broader Northern Forest spanning Maine to New York, 23 million acres were involved in land sales between 1980 and 2005 (Daigle, 2012). The change in ownership has generally involved a divestment of timber or wood products companies and an increase in the forest holding of Timber Investment Management Organizations (TIMOs), Real Estate Investment Trusts (REITs), and land trusts. Since the departure of the giants International Paper, Mead-Westvaco, and Brown Paper Company from the Androscoggin Valley-Mahoosuc region, land has changed hands totaling more acres than are the region itself, including numerous parcels that have been sold two, three, or more times. Today, of the roughly 540,000 acres of timberland in the region, approximately 425,000 acres is in large ownerships (over 20,000 acres). As of 2008, a mere 11 owners controlled 292,000 acres, or roughly half of the region (Weinberg, 2008). Approximately 27,000 acres can be classified as private conservation land, while another 121,000 acres are publicly owned by municipal, state, and federal entities. Pending conservation easements exist on another 38,000 acres, and an additional 100,000 acres are in small woodland ownerships (under 1,000 acres) (Wanner 2014).

The great changes in ownership have altered not only the landbase, but also the social and economic fabric of forest-reliant communities interwoven with the forest products industry. Berlin, New Hampshire, “The City that Trees Built,” was in its heyday from the advent of the railroad into the 1930s, largely due to the success of one key forest products business. As one interviewee observed, *“Back when Brown Company owned the land, everybody could do what they needed to do on the land. When Brown Company sold, not one organization bought it. The size of the parcels is going down, and the number of owners is going up.”* While the larger forest landowners divested to numerous new owners, the mills likewise transferred to ownership by various corporate entities that failed to maintain the social-economic connection with local communities as the Brown family had. The Berlin pulp mill closed and was dismantled in 2006 (City of Berlin 2012). With the separation of forestland from manufacturing assets and the globalization of the wood economy, the regional forest economy reduced its connection to and support for local communities. Though material, equipment, service purchases, and employee salaries remain in the region, the profits go elsewhere.

These changes in ownership and landowner goals inevitably influenced the treatment of forests. As one interviewee put it, *“The time horizon of the landowner is the best indicator of who's going to do good forestry and who's not.”* Another described, *“In New Hampshire, the average land tenure/ownership is 6 years. That doesn't leave you a lot of time to do much.”* The motivations of TIMO and REIT landowners differ starkly from those of both large, non-corporate owners and smaller, non-industrial woodland owners. Investment owners are generally removed from the land, and management activities and are legally required to achieve high, short-

term (10 years or fewer) financial returns. A common perception of such owners is that *"as long as they're achieving those 8-12% returns, they think the world is good."* Shorter time horizons and frequent changes in landowner goals and management styles were perceived by several interviewees as leading to repeated resource extraction and negative consequences to the forest. By far, the most concerning ownership trend to interviewees was the prevalence of TIMOs and REITs. As one expressed, *"They will say they have done exemplary cutting, and a lot of people are going to argue with that....I don't think that bodes well for the future of the area, having land management decisions be based on the bottom line, the deciders of which probably no one's ever been to Maine."*

On the other hand, the locally-based, TIMO employees do not share this view. While such concerns may characterize the investment owner, they do not necessarily reflect the perspective of the foresters living in these communities and managing these lands. One such person described a general focus among foresters in the industry that seems consistent despite changes in ownership: *"Now what I think you see with large ownerships is a willingness to manage what's there for value. So it's more driven by, 'How can we grow value? How do we make money?' And that varies somewhat from ownership to ownership and owner to owner objective, but generally, it means working with what's there more instead of trying to take what's there and manipulate it into something different or by chance, turn it into something different."* This perspective contrasts with historical practices in which timber harvests were more frequently driven by product selection. Regardless of who the landowner is today, the foresters working that land are faced with the same challenges of a landscape shaped by past goals and decisions on the ground. It is the on-the-ground decisions land managers make under challenging conditions that determine how well the forest is being managed. Management in the Androscoggin Valley-Mahoosuc region and the surrounding woodbasket speaks to a wide spectrum of ecological, economic, and social responsibility.

Another key concern expressed by some interviewees is the willingness of some of these larger landowners to explore development and change to the forest landbase in the form of wind projects, electric transmission lines, and other non-traditional uses. From the TIMO perspective, however, some of the biggest threats to the forest are *"emotion-driven regulations."* Many large land managers already devote significant resources to documenting activities to meet third-party certification standards; additional layers of accountability detract from their capacity to manage in an industry that already provides a low profit margin. Another source of tension between large land managers and land users is access. Forest roads historically kept open to the public for traditional uses such as hunting and fishing require costly infrastructure and extensive maintenance. The current owners may not be communicating the economic challenges in a way that satisfies people accustomed to public access to private lands; this issue runs deep in the history and mindset of the region's people, who traditionally were granted access to forests and ponds.

In contrast, some large landowners have also started utilizing working forest conservation easements (WFCEs), which protect traditional forest uses and ensure continued, sustainable management of the forest. WFCEs typically require sustainable forest management and timber harvesting, which is critical to long-term healthy forests and a cornerstone of the region's forest-based economy and communities. In contrast to owners motivated primarily by the bottom line, conservation owners are principally motivated by long-term forest integrity and multiple values. The large urban population of the broader Northeast region has driven an emphasis on preservation, recreation, and public access to forestland (Irland, 1999). *"There has been a big shift in what rural ownership is about,"* described one interviewee, *"First, it was about resources to be extracted.... Now people are more thoughtful, thinking about how our actions might have regional impacts."* This emphasis, aligned

with local efforts to conserve community forestland, has led to an increase in conservation ownerships in the face of the long history of industrial management in the region. Conservation easements are established to benefit the state of the forest. Long time horizons frequently include long rotations, a greater diversity of products, and known players in wood products markets. *"The increase in conservation easements and ownerships in this region does influence the broader landscape,"* described one interviewee. *"For management going forward, my attitude is that easements are protecting the forest and timber supply because it counters the trend of investment owners, who have a short time frame. Conservation lands are setting up our landscape for providing forest values long-term."*

It is clear that the activities of TIMOs, REITs, and other short-term landowners are lightning rods for heated discussion on the impacts of large-scale management on the forest. The ownership model has changed from the heyday of the paper companies, and forest management standards and practices have also changed, even among these "new" owners. Healthy communication between landowners and land users is essential; any regional discussion on the treatment of the forest should involve these industrial land managers and owners. Transparent conversation would explore biases on all sides and lay a foundation for finding common ground for the long-term benefit of the forest and rural communities.

Small woodland owners, whose lands account for approximately one fifth of the area of the region, have still another set of motivations for forest management than those of large corporate or large conservation owners. National Woodland Owner survey (NWOS) results suggest that the top reason Northeast family forest owners keep their land is for its beauty, scenery, or privacy, and that timber production is much less important (Roper Public Affairs, 2006; Butler, 2008). Owners of small, fragmented pieces of forest are less likely to harvest timber (Wear, 1999). In fact, two-thirds of the acres owned by small woodland owners in New Hampshire and Maine are not under a written forest management plan. When asked about their plans for their woodland in the next five years, 54% of survey respondents in New Hampshire and Maine reported that they had no current plans, that their plans were unknown, that they would have no activity, or that they would conduct minimal activity to maintain forestland. On the same survey, 27% planned to harvest firewood, sawlogs, pulpwood, or non-timber forest products, and 10% planned to sell, gift, subdivide, or convert their forestland to other uses in the next 5 years (Butler, Miles, & Hansen, 2012). *"This area is like any; the smaller the parcel, the less chance it will be treated properly silviculturally,"* reported an interviewee. While non-industrial, private woodland ownerships do not dominate the landscape, the decisions made by these family forest owners collectively impact a significant portion of the Androscoggin Valley-Mahoosuc region and can have implications for neighboring regions within the Northern Forest.

In Maine's organized townships within this region, much of the land is enrolled in the Maine Tree Growth Tax Law program (Figure 2). This program allows forest ownerships of 10 acres or greater with a forest management plan written by a licensed forester to be taxed on the basis of its current use (i.e. forestland vs. developable land). There is a similar current use taxation program in New Hampshire and other states. Though this tax incentive program exists, many landowners are not motivated to actively manage their lands with plans or professional assistance. Further opportunities exist to engage more woodland owners in the stewardship of their lands. For instance, bioenergy projects dependent on forest biomass from family forests will have to prioritize landowner education and outreach and emphasize the compatibility of biomass removal with maintaining the scenic beauty of forests. Additionally, the greater Bethel, Maine area has seen increasing interest in housing developments that decidedly do not consider tree growth the highest and best use of the forested landbase. Even *"for someone right now who wants to buy timberland to do sustainable forestry long-*

term, prices are really high,” one interviewee reported. Addressing these barriers to conservation ownership would offer another opportunity to improve long-term forest sustainability in the region.

Figure 2 Current enrollment in the Maine Tree Growth Tax Law program

Data from Maine Forest Service, 2012

TOWN	NUMBER OF LANDOWNERS WITH LAND ENROLLED IN TREE GROWTH	TOTAL ACRES IN TREE GROWTH	% AREA OF TOWN IN TREE GROWTH
ANDOVER	77	24,154	66%
BETHEL	104	15,506	37%
GILEAD	16	5,980	100%
NEWRY	50	25,046	64%
UPTON	15	16,607	62%

Public lands are also part of the makeup of the Androscoggin Valley-Mahoosuc region, ranging in scope and scale from the federal White Mountain National Forest and Umbagog National Wildlife Refuge to the town-owned Randolph Community Forest and Errol’s 13-Mile Woods Community Forest. People’s perceptions of public lands are varied. Some express a distrust of federal land ownership and acquisition, citing the effect on the local tax base and the disconnectedness of federal decision-makers. Many interviewees hailed White Mountain National Forest as practicing exemplary management, a theme that will be explored in greater detail in subsequent sections. On the smaller end of the public land acre spectrum, community forests are widely perceived as beneficial on multiple levels. As one interviewee articulated, *“I think you’d find that publicly owned land, locally held, costs the taxpayer less, and for the long-term, acts as a net benefit to the community. And then that community reflects its values in the land that they own. If you treat the land poorly, your neighbors are going to notice.”*

Ownership, whether large or small, public or private, corporate or family, has a tremendous influence on the role of forests in the region’s rural communities. The balance of landowner motivations, wood products markets, and long-term perspectives ultimately determines the state of the forest landscape. The next section will take a closer look at how these ownership patterns have shaped the composition and quality of the forests in the Androscoggin Valley-Mahoosuc region.

Forest Types

The region today known as Coös County, New Hampshire and Oxford County, Maine, was sparsely settled in the post-Revolutionary War era of early American history. “Spotted trees guided the traveller between the different settlements, but when journeying outside he was obliged to depend partly on his own sagacity and partly on the course of the sun and the position of the mountains” (Lapham, 1890). An interviewee elaborated, *“The forest in our area was originally assembled to supply high-quality logs used to build the nation during the 1800s. As the demand for paper increased, ownership of these lands transferred to paper companies. The primary focus became supplying high quality pulpwood for paper manufacturing.”* By the late-19th century, populations had grown to the tens of thousands with the advent of the railroad and the rise of the pulp and paper industry. By the turn of the 20th century, international giants such as the Brown Paper Company had become the

primary force shaping the forest landscape. The decline of the industry began in the 1930's and continued until the national divestiture of vertically integrated companies in the 1990's. The 21st century, however, brought with it sharp declines in the domination of the pulp and paper industry and industrial timberland ownership across the landscape.

Despite the resulting shift of wood products markets, pulp bears an enduring legacy in the forest products industry. Today, much of the region is comprised of second- or third-growth forest that has yet to reach late seral (developmental) stages (Irland, 1999). Interviewees describe the stands as two-aged or even-aged: "Often in these two-aged stands, the older age class is made up of residual subordinate trees from the previous stand. Unfortunately, subordinate trees do not represent the best potential of the site, leaving residual overstories in rough shape. Fortunately, understories in these two-aged stands are typically robust and growing well."

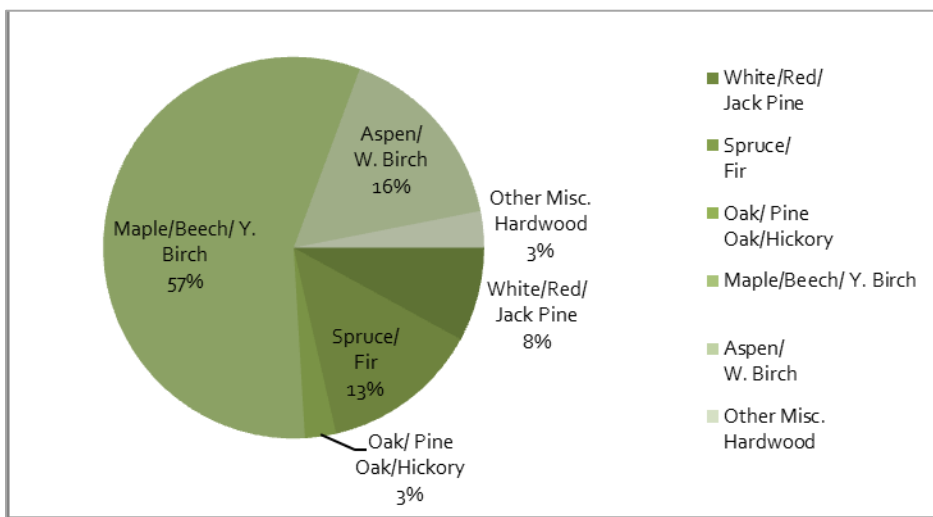


Figure 3 Major Forest Type Groups within Region, 2011

Data from USDA Forest Service Forest Inventory and Analysis Program

USDA Forest Service Forest Inventory and Analysis (FIA) data were analyzed for the core of the Androscoggin Valley-Mahoosuc region in a rectangle encompassing Errol and Millsfield, New Hampshire in the northwest; Township C and Andover, Maine in the northeast; Bethel, Maine in the southeast; and Gorham and Berlin, New Hampshire in the southwest (approximate area depicted in Figure 1). The analyzed area includes a portion of the White Mountain National Forest. These data show that the forest landscape in the Androscoggin Valley-Mahoosuc region is dominated by hardwoods; over two-thirds of the acreage is in the birch-maple-beech (*Betula alleghaniensis*, *Acer saccharum*, *Fagus grandifolia*) or aspen-birch (*Populus spp.*, *Betula papyifera*) forest types (Figure 3). Spruce-fir (*Picea spp.*, *Abies balsamea*) takes up another fifth of the acreage, while the remainder is filled by mixtures of oak, pine, and other species. The present mix of species may change over time due to factors such as the invasive insects and diseases, shifts in climate, and other unforeseen factors, but the current range of forest types is typical for the region.

Nearly one quarter of the timberland acres in the region are estimated to be under 30 years old, while two-thirds of the timberland acres are classified as between 30 and 90 years old (USDA Forest Service, 2011). The stand ages likely reflect the history of heavy cutting and clearing at the turn of the 20th century followed by a long period of regeneration, as well as stand-initiating harvests in the 1980s. Figure 4 shows the acres of each stand size class within the major forest type groups. By forest type, maple-beech-birch dominates the landscape with 124,000 acres in sawtimber-sized stands, 102,000 acres in poletimber-sized stands, and 63,000 acres in seedling/sapling-sized stands for a total of 288,000 acres. Aspen/white birch stands occupy the next

greatest acreage at 83,000, over half of which is in the seedling/sapling stand size class, a third of which is in poletimber-sized stands, and the remaining 11,000 acres of which is in sawtimber-sized stands. Spruce-fir stands occupy the next greatest acreage at 68,000, half of which is in the seedling/sapling stand size class and the remaining acres split nearly evenly between poletimber- and sawtimber-sized stands (USDA Forest Service, 2011). From the landscape view, these data are not unexpected. As we zoom in for a closer look at forest growth on different ownership types, however, some intriguing discrepancies emerge.

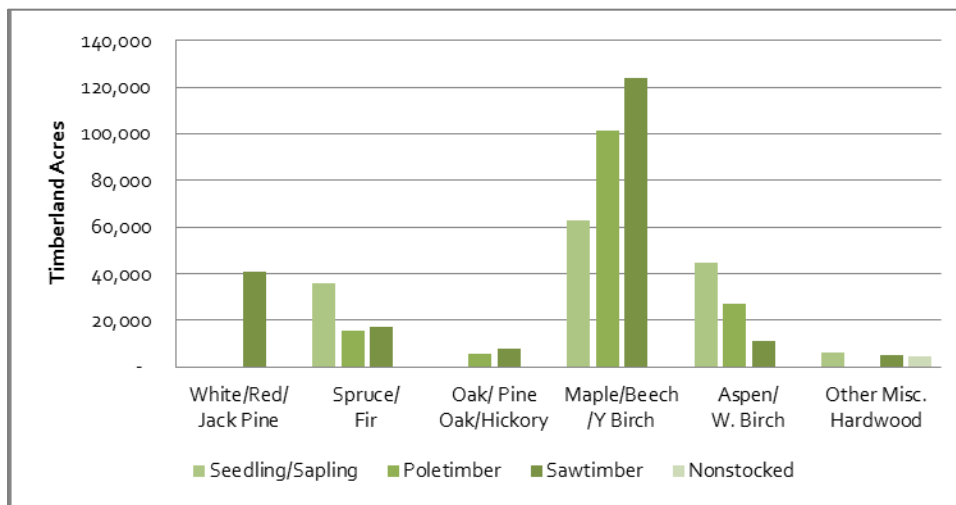


Figure 4 Stand size class by major forest type group, 2011

The region's forest landscape is dominated by acres of birch-maple-beech stands in the sawtimber, poletimber, and seedling/sapling size classes.

Data from USDA Forest Service Forest Inventory and Analysis Program

Forest Growth

The region as a whole is estimated to be growing approximately 0.37 cords per acre per year (USDA Forest Service, 2011). The actual growth rate varies from stand to stand and is dependent on landowner actions, silvicultural treatment history, climate regime, site index, soil type, and other factors. Likewise, the question of what is considered sustainable varies from site to site. One large landowner estimates a growth rate of .45 cords per acre per year on a particular land unit, while another estimates .36 on a nearby ownership. In addition to being inaccurate, the adage of an average of 0.5 cords per acre per year is deceptive in its simplicity. Most interviewees reported challenges in achieving harvest equal to growth on their own lands, but several also observed instances on certain other ownerships in which harvest exceeded growth with varied silvicultural results.

In addition to an imbalance between growth and harvest, the landscape management history is reflected in an imbalance in age class. As one interviewee articulated, *"Mother Nature is very forgiving, and all our land will continue to grow trees for the most part. What we're going to have is a tremendous age-class problem. The harvesting rate right now is sustainable from a regional view, but is not within our communities. The supply's going to be a problem; the growth isn't."* In other words, the region as a whole may be growing the quantity, but not necessarily the quality required to sustain a wood products-based economy and the local communities. A balance of age and product classes – high-quality sawtimber as well as low-grade pulp and biomass – is needed to sustain healthy forests and support a healthy forest-based economy. This is critically important to understanding the capacity of the region to sustain forests, the forest-based economy, and rural communities. Despite the long history of management for pulp, this landscape is capable of growing a diverse mix of wood

products with multiple benefits to forest users. Under current management regimes, however, this region has yet to achieve this potential.

Distinctions in the condition of the forest resource are visible between privately and publicly owned lands. As interviewees reported, public lands are generally managed more thoughtfully than surrounding private lands in the region. Private lands, which dominate the landscape, exhibit opportunities to be managed for diversity in both age class structure and product value; some ownerships to a greater degree than others. Any discussion of improving management to achieve a vision of vibrant forests must involve private forestland owners and managers.

Figure 5 Stand size class comparison between public and private ownerships

While public ownership acres are dominated by the sawtimber size class, private ownership acres are dominated by the seedling/sapling size class. Collectively, stand size classes across the landscape are nearly evenly split between sawtimber, poletimber, and seedling/sapling.¹

Proportionally, public ownerships are growing a significantly greater volume of sawtimber than are privately owned lands.

Data from USDA Forest Service Forest Inventory and Analysis Program

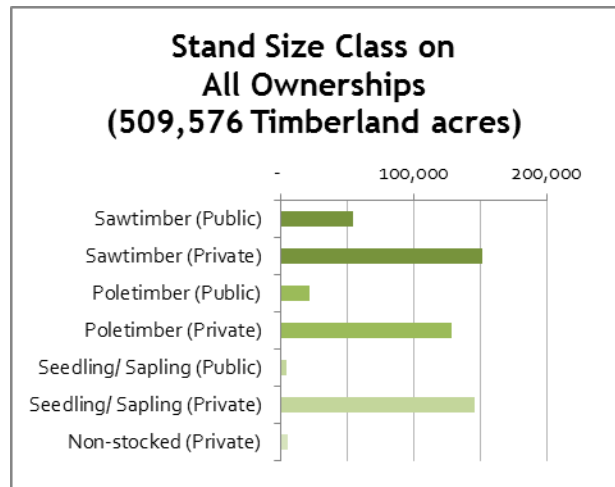


Figure 5a

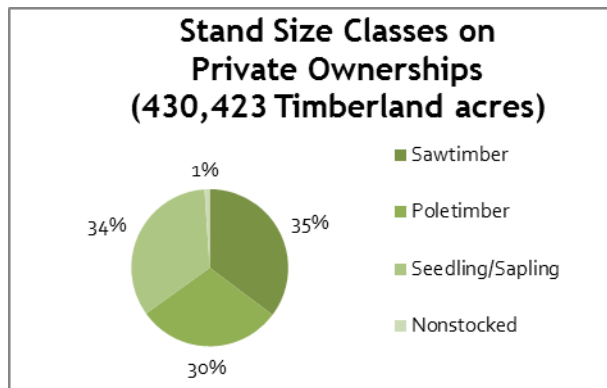


Figure 5b

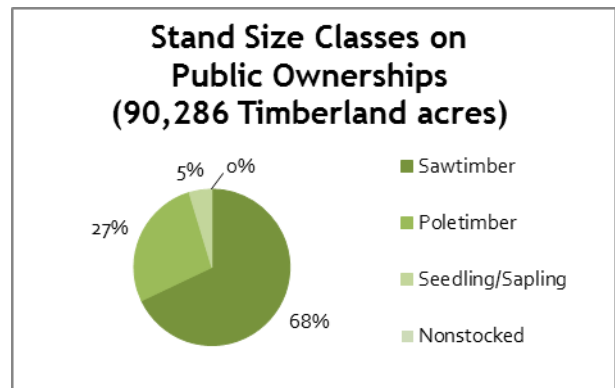


Figure 5c

Figures 5a-c illustrate the striking difference in stand size classes between publicly and privately owned lands in the region. Private landowners are creating young stands in a way public lands are not, and public lands are retaining and enhancing older forest in a way that private lands are not. These differences create an

¹Sawtimber tree: A live tree of commercial species containing at least a 12-foot sawlog or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches diameter outside bark (d.o.b.).

Poletimber trees: Live trees at least 5.0 inches in d.b.h., but smaller than sawtimber trees.

Saplings: Live trees 1.0 to 4.9 inches (2.5-12.5 cm) in diameter (DBH/DRC).

Nonstocked areas: Timberland less than 10 percent stocked with all live trees.

imbalanced mosaic of forest conditions across the Androscoggin Valley-Mahoosuc region. Over a third of privately owned timberland acres are in the seedling/sapling stand size class, whereas only 5% of public forest acres in this region are in this young forest stage. The other 95% of publicly owned timberland acres are in the sawtimber or poletimber stand size classes, compared to 65% of timberland acres in private ownerships growing these higher-value products. It is important to note that these stand size class distributions may not be consistent across individual ownerships. For instance, some landowners may be harvesting larger timber and regenerating younger stands, while other landowners may be managing with a focus on retaining older age class structures.

From a broad perspective on the state of the forest, the regional landscape presents a fairly balanced mix of stand size classes with a near-even split between sawtimber, poletimber, and seedling/sapling size classes. However, the discrepancy between the stand size class distributions on private versus public lands (and between individual ownerships therein) illustrates the variability in the management histories, management goals, and product availability across these ownerships. Significantly, although public lands cover only 15% of the acreage in the region, they account for over one-quarter of the total acres of sawtimber. Therefore, a good supply of sawtimber is theoretically available from public ownerships. This figure is consistent with one of the described objectives of the White Mountain National Forest: "Manage vegetation using an ecological approach to provide both healthy ecosystems and a sustainable yield of high quality forest products, with special emphasis on sawtimber and veneer (USDA Forest Service 2005)," or as an interviewee articulated, "*growing high-quality saw timber achieved through long-rotation silviculture.*" Public lands are growing high-value sawtimber in volumes significant to the local forest-based economy. Private lands, which dominate the region, have the opportunity to do the same.

What kinds of forest products can be milled from these stand size classes? FIA data show in Figure 6 that forests in the Androscoggin Valley-Mahoosuc region are growing a high volume of prime sawtimber (Grades 1, 2, and 3). Approximately three-quarters of Eastern hemlock, and Eastern white and red pine volumes may be considered sawtimber-quality, as well as approximately half of the volume in ash, select red oaks, spruce-fir species groups, and over 40% of the volume in hard maple and yellow birch. The data show that the region is capable of growing high-quality, high-value sawtimber in addition to the pulp for which it is famous. The forest resource itself has the capacity for supporting a local, forest-based economy based on a balanced mix of wood products from sustainably managed forests. Whether the forest will achieve that potential is subject to a number of factors including landowner motivations, forest policy, silvicultural practice, and market dynamics.

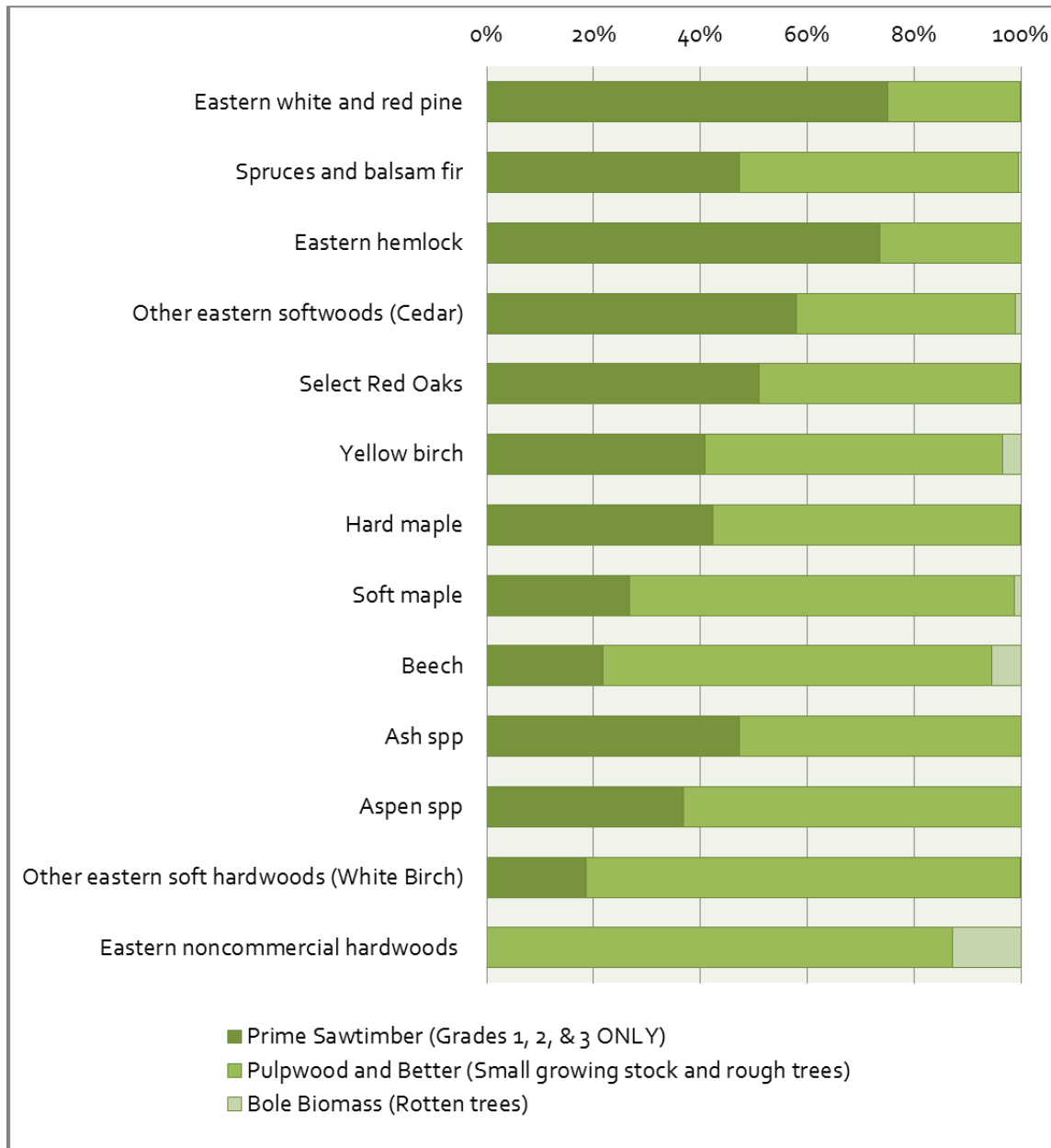


Figure 6 Distribution of species group volume by product, 2011

Data from USDA Forest Service Forest Inventory and Analysis Program

The Basics of Growing Value

Forest product markets have many components that are related to the quality and type of woody material harvested in the forest. The graphic below illustrates the differences in the values of various wood products. Stumpage price equivalents are drawn from 2011 data for Oxford County, Maine (Maine Forest Service, 2011). It makes the most economic sense for marked wood to go to its highest-value use. For example, a recently harvested 26-inch diameter, 205-year-old spruce tree sold for roughly ten times more as wood for producing violins and guitars than it would have as a pulp log. This log's story is unusual and will be explored in greater detail.

Forest management activities ideally include consideration of the long-term market potential. A sapling worth \$2/ton as biomass may grow into a pole of firewood worth \$39/ton and eventually into a sawlog or veneer log worth of hundreds of dollars per equivalent ton. Alternatively, trees suitable for a biomass market may be diseased, suppressed, or deformed with no potential to become sawlogs and only take up growing space from more valuable trees. Therefore, short-term economic gains from a timber harvest today need to be weighed against potential future economic returns.

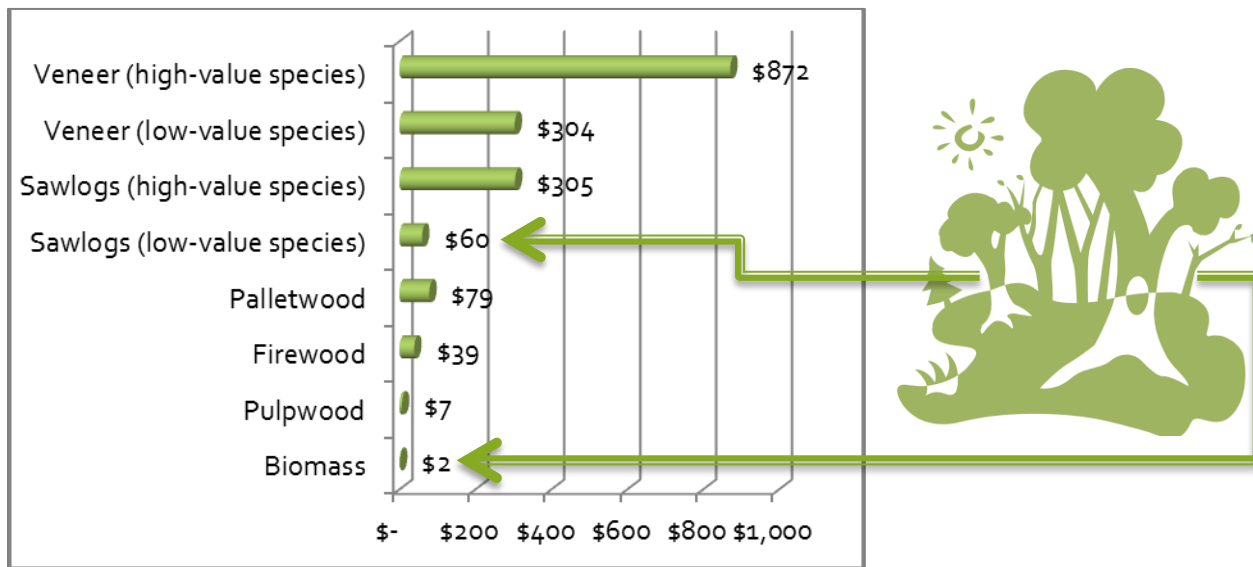


Figure 7 Forest Product Value Range, \$/Ton Equivalent

Trees increase in value as they grow through various product classes. Stumpage prices are the value of the standing timber, prior to cutting, shipping, or processing. Data derived from Maine Forest Service 2011 Stumpage Price Report.

Harvest Volumes

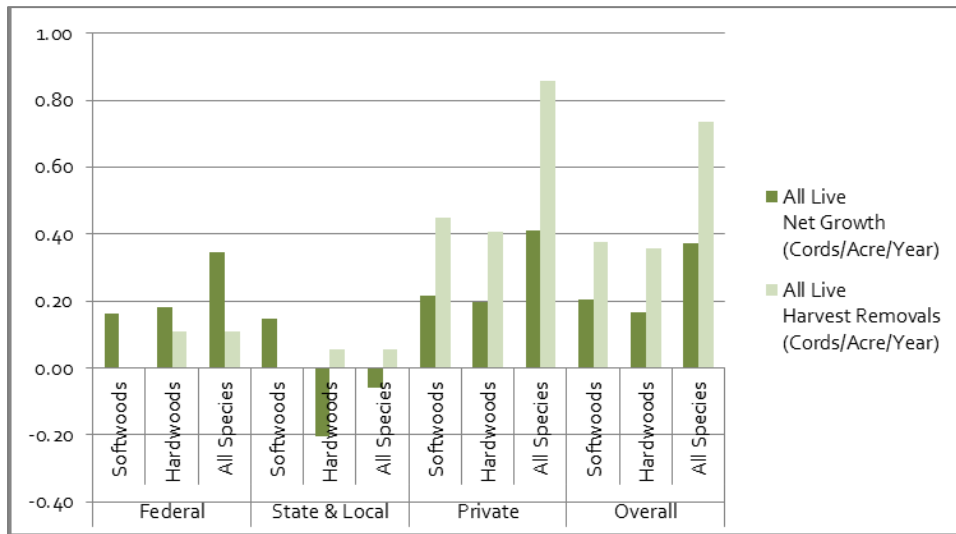


Figure 8 All live net growth and harvest removals by ownership class, 2011 (cd/ac/yr)

Private ownerships, which dominate the region, are cutting roughly twice as much wood as is growing each year.

Data from USDA Forest Service Forest Inventory and Analysis Program.

In a direct comparison of harvest removals to net growth within the region, FIA data show that private ownerships are cutting at twice the rate of growth for both softwoods and hardwoods. Harvest exceeds growth on state and local ownerships while growth and harvest are more in balance on federal lands. Therefore, although growth exceeds harvest volume across the overall region, these stark differences indicate an imbalanced patchwork of treatment to the forest. It is also interesting to compare growth versus harvest rates in Coös County, New Hampshire to those just over the border in Oxford County, Maine. Hardwoods are being harvested in excess of growth on the Maine side, while softwoods are being harvested far in excess of growth on the New Hampshire side. These different impacts may be ascribed in part to different forest histories (e.g. spruce budworm impact in Maine) and resulting stand compositions. However, the overarching effect of today’s harvesting trends is an imbalance of forest conditions across the region. FIA data show a harvest rate of 0.74 cords per acre per year across the region, double the growth rate of 0.37 cords per acres per year. By many accounts, harvest this much in excess of growth is considered unsustainable.

Figure 9 Net Growth/Harvest Ratio in Coös County, NH and Oxford County, ME

Figures under 100% indicate harvest in excess of growth. Data from USDA Forest Service Forest Inventory and Analysis Program.

	COÖS COUNTY, NH	OXFORD COUNTY, ME
SOFTWOODS	68%	119%
HARDWOODS	105%	92%
ALL SPECIES	83%	103%

On the forest type level, the imbalance of growth and removal is more striking still. Harvesting is occurring at an unsustainable level quite in excess of net growth in Spruce/Fir, Maple/Beech/Birch, Aspen/White Birch, and Other Hardwood forest types. On the bright side, there is robust net growth relative to harvest in the White/Red/Jack Pine forest type, including in the sawtimber size class (remember this forest type accounts for only 8% of the acres examined). Additionally, the negative net growth perceived in the category dominated by

white birch is likely a stand age/natural succession issue; i.e. the trees in these stands are reaching senescence and natural mortality.

The region is capable of growing high-quality material, and there is an opportunity for this valuable wood to be harvested and processed for the highest and best use of the material. However, for a number of complicated reasons, the data tell a rather different story. On private lands in Coös County, New Hampshire, the volume of pulpwood harvested during 2000-2010 has been roughly double that of sawlogs. This is disproportionate to the stand size classifications on private lands. It is also incongruous with the potential to optimize product value. It does, however, reflect the historical mentality of growing pulp forests.

In contrast, while the volume of sawtimber harvested has declined across the state of New Hampshire, the sawtimber contribution from the White Mountain National Forest increased, essentially anchoring the market for high-value forest products. In fact, FIA data show that 57 percent of the total Grade 1 (16 inches DBH or greater) hardwood sawlog removals in entire the State of New Hampshire are contributed by this federal ownership. In other words, while private lands have been producing high volumes of pulpwood, these publicly-owned lands have been growing a significant amount of top-quality, high-value sawlogs. A recent report by the White Mountain National Forest illustrates that this niche of high-quality sawlogs produced by long-term management brings proportionally greater economic returns back to the region (USDA Forest Service 2014). Local logging, trucking, and milling businesses can depend on the National Forest as a stable source of income with a proportionally higher profit margins associated with higher-value wood products. On a local level, towns surrounding the National Forest are directly tied to its economic footprint because the quality of life supported by this ownership draws people to live there. *"This ties to the benefit of the White Mountain National Forest that is nearly impossible to quantify....It is simply that we are part of what makes this area special to its residents and the quality of life of many would be diminished if we weren't here, even if they don't directly economically benefit from our presence."* As long as the White Mountain National Forest continues to provide the economic, social, and ecological benefits, the communities dependent upon it will continue to be sustained by a natural resource-based economy.

The data prove that long-term forest planning and management can add significant value to the region's economy. However, harvest volumes of the highest-quality material growing in the region are restricted by factors such as roadless rules, federal budget cuts, and successive workforce reductions. While the Forest Plan allocates a sustainable harvest volume of 24 million board feet per year, the Forest has only been able to offer roughly 11 million board feet in recent years (USDA Forest Service 2005). As one interviewee described, *"Quality is very hard to get. The White Mountain National Forest is doing a good job of growing timber, but they've got to be allowed to cut their allowable cut."* While the White Mountain National Forest provides an excellent silvicultural model for the region, other factors would have to be addressed to use this model to improve the economic sustainability of the region's natural resource management.

Forestry

Silvicultural trends

How is all this wood being harvested, and what effect do these practices have on the forests of the Androscoggin Valley-Mahoosuc region? The state of the forests reflects the spectrum of silvicultural practices

implemented by the myriad of individuals and entities that own or have owned the land. Within the region, the general trend today has been described by several interviewees as “rehabilitation silviculture.” This phrase does not have a true silvicultural definition, but has been used to describe treatments intended to restore or improve forest stand conditions in the wake of historical mistreatment. Across the Northeast, specific silvicultural treatments range from intensive management with clearcuts, herbicides, and relatively short rotations to patch cuts, thinnings, and single tree selection. The intensity and frequency of management varies and are affected by the size of the landbase, site conditions, and the landowner’s goals. Whether these practices are “good” or “bad” is subjective and determined by landowner objectives. As one interviewee articulated, however, *“Good or bad is not subjective when it comes to ecology, sustainability, forest health, or even economic development. It’s a matter of public good versus private rights.”* Some management regimes are designed to mimic natural disturbance and provide other amenities such as wildlife habitat, while others may have been designed to maximize economic return, and many fall between these two goals.

While the Androscoggin Valley has been described as being dominated by a two-aged structure, it is dominated by northern hardwoods, which are well suited to uneven-aged management because many of the commercially important species (e.g. sugar maple, yellow birch) are shade tolerant. This region’s forest is capable of undergoing a variety of treatments to achieve age class diversity within the balance of ecological and economic constraints. However, comparatively few acres are being managed for older age-class structures. Interviewees suggest that longer-rotation forestry is uncommon, although there is some fostering of older age-classes and higher products through silvicultural treatments such as crop tree selection on ownerships such as the White Mountain National Forest. One interviewee observed of the region as a whole, *“If you want to look at it from the view of silviculture, it’s being managed even-aged. It’s not a bad thing; it can be a good thing. My problem is that you can’t treat every acre even-aged. There are people who manage woodland, and there are people who cut wood. I think there are a lot of companies here now that cut wood.”*

The even-aged management technique of clear-cutting is not uncommon in the region, and its practice elicits differences of opinion as to its impact on the landscape. Clearcuts of course affect wildlife, but as to whether the impacts are “good” or “bad” is somewhat subjective; clearcuts provide excellent moose browse, but do nothing for pine marten, which depend on an older, more closed-canopy forest structure. As reflected in these interviews, the results of clearcut treatments vary across the region. As one interviewee summarized, *“You can clearcut a forest, and it doesn’t mean you’re getting 80% sawlogs back. That’s the mentality we’ve gotten into; ‘Oh, we’ve got 40% sawlogs out there. Let’s clearcut it or even-age it, and we’ll get better than what we had.’”* In contrast, others believe *“there is a silver lining. Wildlife habitat and sustainability aside, one thing they are doing is starting stands over with clean, robust regeneration. In cases where the alternative would have been to leave a suppressed overstory, they’re now talking about going into stands cut 20 years ago and doing pre-commercial thinning.”* While perceptions differ, most will agree that thoughtfully-applied silvicultural treatments, including clear-cuts, can be useful tools for achieving a balance of age-class, wildlife habitat, and economic objectives.

Conversations with people who live and work in the woods in this region illuminate fascinating insights not necessarily captured in the data. Forests are described as resilient despite inconsistent silvicultural treatment through time and across the landscape. The legacy of the pulp and paper industry is still strong; in reading the landscape history, the woods illustrate a long-standing desire to grow volume, not necessarily quality. *“We’re managing for pulp production, and there’s less managing for sawlogs,”* reported one interviewee. *“I live in Coös County, and we do not have big trees in Coös County; everybody thinks they’re mature at age 40.”* The potential exists for the forest to grow more sawlogs and veneer, or high-value forest products. Herein lies an opportunity

for the Androscoggin Valley-Mahoosuc region: to create a vision of a future forest that maximizes the potential of the growing ground for the long-term benefit of the forest resource and the human and natural communities dependent upon it.

Programs and Practice

While landowner objectives are the primary driver behind regional silvicultural trends, forest management practices are subject to state regulations, “acceptable” or “best” voluntary practices, and options such as third-party certification. Forestry rules and recommendations govern how forests may be harvested and what outcome such activities are intended to have on the environment; for example, the protection of clean drinking water or the retention of soil nutrients and stability.

Best Management Practices (BMPs)

In the Northeast, voluntary best management practices (BMPs) to protect water quality are determined at the state level. BMPs typically address timber harvesting, site preparation, reforestation, stream crossings, riparian management zones, prescribed burning and fire lines, road construction and maintenance, pesticides and fertilizers, and wetlands. These programs are routinely monitored, and literature suggests that when these BMPs are properly implemented, they do protect water quality (Shepard, 2006). For example, BMP monitoring in Maine revealed that water quality BMPs were effectively applied in 77 percent of stream crossings and 89 percent of approaches to the crossings (Maine Forest Service 2008). 2013 data confirm an increase in BMP application with positive benefits to water quality (Maine Forest Service 2014). Anecdotes from interviewees also confirm that BMPs have overall improved the protection of soil and water resources during timber harvests. However, there are some operators who “go in all conditions,” including wet days when most have shut down in accordance with BMPs. In these instances where BMPs are not adequately applied, the risk is greatly increased of detrimental impacts to the local water resource. Such decisions, and their environmental consequences, are ultimately driven by the landowner’s objectives. The region, which is mostly privately owned, needs landowners that value clean water and other public benefits and are willing to make management decisions that uphold these values.

Biomass Harvesting Practices

With the new large biomass-electric power plant in Berlin NH, it is worth examining how existing practices affect the harvesting of woody biomass. Even though BMPs have traditionally focused on water quality, they can influence other elements of harvesting and retention, which in turn determines how and how much biomass is harvested for bioenergy projects. For example, in New Hampshire, guidelines recommend leaving “some cull material” in the woods after a biomass harvest (Chapman, 1997). The same guidelines provide recommendations related to soil productivity that would limit biomass removal on sites with nutrient-poor soils: specifically, to use bole-only harvesting (taking out the main portion of tree only, leaving branches and limbs in the woods) on low-fertility soils, or where fertility is unknown, retaining tops and limbs as a precaution against nutrient loss. Other examples of ways BMPs can influence harvest volumes and footprints are through recommendations for the retention of snags, wildlife trees, downed logs, and riparian buffer zones (Evans et al., 2010).

Regulatory influences on sustainable forest practices and bioenergy production are not limited to BMPs. Social acceptance is one of the driving forces behind the creation of new retention and harvesting guidelines specifically for biomass removals for the bioenergy market. A number of states including Maine, Maryland, and

Pennsylvania have created guidelines specific to biomass harvests (Evans et al., 2010). Vermont is currently undergoing a similar process to develop guidelines, and regional biomass harvest guidelines have been suggested including the *Forest Guild's Biomass Retention and Harvesting Guidelines for the Northeast* (Forest Guild 2010). Such biomass harvesting guidelines are designed to fill the gaps where existing BMPs may not be sufficient to protect forest resources under new biomass harvesting regimes. A recent study of the ecological implications of biomass harvests in Vermont concluded that with existing practices exhibited by some operators, a high bar has been set, and "guidelines can play a positive role encouraging others to improve harvesting practices" (Keeton, 2012).

Third-party Certification

Third-party forest certification is an optional, though increasingly common, means of ensuring sustainability in forest management. Several of the large ownerships in the Androscoggin Valley-Mahoosuc region are managed according to the sustainability principles of the Forest Stewardship Council (FSC) or the Sustainable Forestry Initiative (SFI). Additionally, a number of loggers who operate in the region are certified by the Northeast Master Logger Certification Program, which is integrated into the FSC standard. It is important to consider the potential of certification effects on forest product markets. Forest certification arguably can affect price and could influence the use of wood for bioenergy. While some research has found that certified wood can get a small (five percent or less) price premium, many companies have found access to some markets requires certification (Auld, 2008). Anecdotal evidence from the pulp market corroborates this finding; mills and bioenergy facilities sometimes show preference for certified over non-certified wood.

Bioenergy facilities across the Northern Forest are heavily dependent upon wood, a fair amount of which comes from certified sources. Certification is already pervasive enough in the Northeast that most bioenergy projects could draw some material from certified lands, but currently it would be difficult to use only certified wood in a medium to large bioenergy project. While no certification system for the U.S. specifically addresses biomass harvests, certification can influence the harvesting of wood fuels. For example, FSC certification requires that "management maintains, enhances, or restores habitat components and associated stand structures, in abundance and distribution that could be expected from naturally occurring processes;" these habitat components include "live trees with decay or declining health, snags, and well-distributed coarse down and dead woody material" (FSC, 2009). Should the demand arise, this type of requirement under a forest certification program can help ensure ecological sustainability during the harvest of forest biomass for energy needs.

Overall, how much difference has third-party forest certification made on the ground? Perceptions of the effectiveness of third-party certification systems are mixed. On the positive end, some interviewees see improvements in overall forest practices, as well as logger training and safety. Others expressed that certification did not significantly change their land management practices; they were already doing a good job, and certification added a layer of accountability and paperwork to their responsibilities. However, numerous interviewees report negative repercussions including confusion between the competing systems, lack of market demand, high cost of certification, flaws in individual systems or ownerships, and a disconnect with local businesses. As one interviewee summarized, *"This is what I am hearing from auditors: Certification made a difference up until about 2000. Since then, nothing has changed, and certification systems have not challenged the long-term assumptions. The management based on these assumptions appears to greatly reducing stand age and putting more and more mature forest species at risk. Moreover, a number of certified landowners have gone 5 or 10 years of harvesting more than growth with plans to maintain harvest levels. This does not appear to be*

ecologically or silviculturally sustainable.” It is beyond the scope of this report to determine the actual effectiveness of third-party forest certification; given the concerns raised by interviewees about the impacts within this region, a closer examination may be warranted.

Conservation Tools

Approximately one-quarter of the landbase within the region may be considered “conservation land” with ownership by conservation non-profits or federal, state, or local government entities. Within this region, working forest conservation easements (WFCEs) have grown in popularity as a mechanism for ensuring sustainable management of the working forest landscape. *“If we can keep working forests, people value that; they value these forests for what they are,”* explained one interviewee. Approximately 34,000 acres of this land are under WFCEs, and an additional 113,000 acres can be classified as conservation land being managed with conservation goals. An additional approximately 38,000 acres of easements are pending (Wanner 2014). When enforced, easements prevent development and ensure that any future landowner will abide by management directives that tend the land, not abuse it. For example, one pointed out, *“in the broader context of future owners that might have more interest in short-term financial gain, let’s say, the easement is very helpful. What you don’t see are the owners that elected not to buy the property because they were scared away by the easements. It’s the guy that was looking for the deal that didn’t buy it.”*

Forest Product Markets

Forest product markets have a direct and tangible impact on the state of the forest. As one interviewee depicted, *“I’ve been cutting wood since the ‘70s, and we’re mechanical now. But if you didn’t have a market for smaller wood, you wouldn’t cut it...Wood’s not being left to grow. Butt-cut eight-inch oak with four clear sides – whole truckloads – fit in my pallet grade for flooring because somebody bought the log and they have to pay for it. If there was no market for that, they wouldn’t cut it.”* Markets are needed for low-grade material as well as for sawmill-grade material to ensure that good quality logs are grown – and harvested – in a timely manner for their highest and best use. Diversified local wood products markets are critical to sustaining healthy, well-managed forests and a stable forest products industry. In the Androscoggin Valley-Mahoosuc region, forestry practices are driven by sawmills, pulp and paper products, and bioenergy markets.

Sawmills

Based on a recent study, the median size of the woodshed for softwood and hardwood mills in the Northern Forest are about 1,600 square miles and 3,400 square miles, respectively (Anderson, 2011). That can translate to one, two, or more hours of driving a loaded diesel log truck on back roads in all conditions to supply a mill with the desired wood product. Areas of high hardwood procurement pressure are based on the overlapping woodsheds for existing mills and are highest in Herkimer County, New York, central Vermont, and western Maine. The same analysis suggests that the areas of greatest softwood procurement pressure were Somerset and Piscataquis counties, north of Moosehead Lake in Maine with some pressure in northern and southwestern New Hampshire (Anderson, 2011). There are approximately 161 sawmills operating in New Hampshire (North East State Foresters’ Association 2013) and 126 primary processing mills in Maine, including pulp and paper mills (Maine Forest Service 2014). The price a mill will pay a wood supplier for a specific product is an unending dance based on geography, available supply, market demand, and other nuances. In a strong economic

upswing, this dance can be lithe and athletic. In a down economy, the dance is exhausting, and only the strongest are able to keep moving.

Sawmills buy high-quality, high-value trees and mill them into dimension lumber and other primary wood products. These wood products may be purchased for construction, secondary wood products manufacturing, or other uses. However, the survival of local sawmills is challenged by cheaper imported wood products from countries with little environmental regulation, as well as growing stressors on the local forest products industry. Within the Androscoggin Valley-Mahoosuc region, *"You'll notice that so many mills have closed in the last 20 years,"* one interviewee described, *"Since I've been in business, there are 40 mills that are gone forever, and those are within three or four hours of here. But the mills that remain, the largest mills in New Hampshire up here, have to be productive to stay in business."*

In order to be competitive, sawmills and secondary wood product manufacturers must meet contemporary expectations of speed, choice, service, personalization, and other customized demands. *"Guys our size find it very tough to stay in business because we can't grab the economy of scale where we can take every opportunity to invest in new technology,"* stated one interviewee. *"So we've found a spot where we are very flexible. We do a lot of specialty items. We change constantly, very custom-focused, and it keeps us going, but it's tougher."* Identifying and replicating the elements of survival and success would provide an opportunity to strengthen the viability of the region's sawmills.

Pulp

The pulp and paper industry has historically played a large role in the region's forest products industry. Although paper companies no longer dominate the industry in New Hampshire, they are still a strong presence in neighboring Maine. Roughly ten times the volume of pulpwood is exported from New Hampshire to Maine as is travels from Maine to New Hampshire (Maine Forest Service 2009-2011). Annual exports of paper, paperboard, and pulpwood total \$651 million, or nearly three-quarters of the total wood product exports from the State of Maine (Maine Forest Products Council 2013). While less valuable than sawlogs, pulpwood is, in a sense, the bread-and-butter of northern New England's forest products industry. *"Lower-grade markets are important, too. There are way more jobs created by this pulp than there is by this sugar maple log even though the sugar maple is more valuable to the landowner, more valuable to the mill, and it's going to make some fine product,"* attested an interviewee. Despite the importance of this product, most pulp mills in New England are outdated, and some of this wood travels enormous distances to reach the pulp mill (see Wood Flows section below).

Bioenergy Markets

Bioenergy provides markets for poorly-formed, low-value wood that ideally is removed so that the remaining trees will grow better. Although the removal of this low-grade material provides great ecological benefit, it is worth so little money that its removal frequently presents a cost or a minimal gain to the landowner. Therefore, markets for low-grade material are essential to ensuring sustainable conditions in the forest. Markets and prices determine which trees are considered sawtimber or pulpwood material and which are used for bioenergy. While it is highly unlikely that bioenergy markets will compete with the demand for high-quality sawtimber, there is speculation that market competition may arise with pulpwood and other traditional uses where woodsheds overlap.

Biomass Chips

The 75-MW Berlin Station bioelectric plant, which opened its doors in the fall of 2013, requires a wide geographic net to meet its fuel sourcing needs, and biomass chips are already a significant product by volume in New Hampshire's forest products industry. For comparison, the Schiller biomass plant in Portsmouth, New Hampshire is a 50-MW facility that utilizes half a million tons of biomass each year. This volume, however, is reported to be all excess capacity; the biomass is essentially a waste product from harvesting operations focused on higher-value products (Roy, 2012). Conversations with large land managers in the woodbasket for the Berlin Station revealed that biomass harvesting is already part of their forest management and that while they welcome the low-grade wood market, their silvicultural strategies are not likely to change significantly because of it. This contrasts with speculation of some that someday *"we're going to see a time where wood is worth more to burn than to make paper."* In truth, it will take time to gauge the real impact of the Berlin Station bioelectric plant on the region as markets adjust and prices settle.

Wood Pellets

Bioenergy can play an important role in providing new markets for industry, as is demonstrated by the growth in the pellet market. In 2009, the Northeast accounted for about 24 percent of the wood pellet production capacity or about 1 million metric tons (Spelter, 2009). Reports on forest products are beginning to include biomass chip or bioenergy harvests. In Maine, for example, biomass chip harvests increased from 0.9 to 2.7 million cubic meters (0.4 to 1.2 million cords) between 2000 and 2008 (McCaskill, 2011). Interestingly, in the Lake States, the increase in demand from pellet manufacturers is beginning to replace declining demand for lower-quality roundwood from the paper industry (Luppold, 2011). Maine Energy Systems, based in Bethel, Maine, is helping to increase the demand for wood pellets within the Androscoggin Valley-Mahoosuc region and beyond.

Firewood

Another important bioenergy product to consider is landowner-harvested firewood. In the Northeast, about 34 percent of family forest owner say they harvest firewood from their property (Roper Public Affairs, 2006). New Hampshire and Maine showed 99% and 96% increases, respectively, in residential wood heat per capita between 2000 and 2010 (Alliance for Green Heat, 2011). However, although heating oil usage has decreased significantly, the vast majority of homes in the rural Northern Forest still heat with non-renewable fuels sourced from well outside the region. An opportunity certainly exists to heat homes with renewable resources grown right within the Northern Forest region.

Wood Flows

The flow of wood from forest to finished product is a complicated journey that often involves crossing state boundaries. As the graphic below illustrates, the exchange of wood products may be fair in terms of each state's mill capacity, though not always equal in terms of volume. Maine is a larger state than New Hampshire and still has an active pulp and paper industry. Maine imports over ten times the volume of pulpwood from its neighbor as New Hampshire does from Maine. However, due to industry decline and consequent mill closures, that pulpwood may be traveling much further to reach its destination than it had historically. Additionally, sawmill residues in Maine are used by pulp mills, although some may feed the growing wood pellet industry.

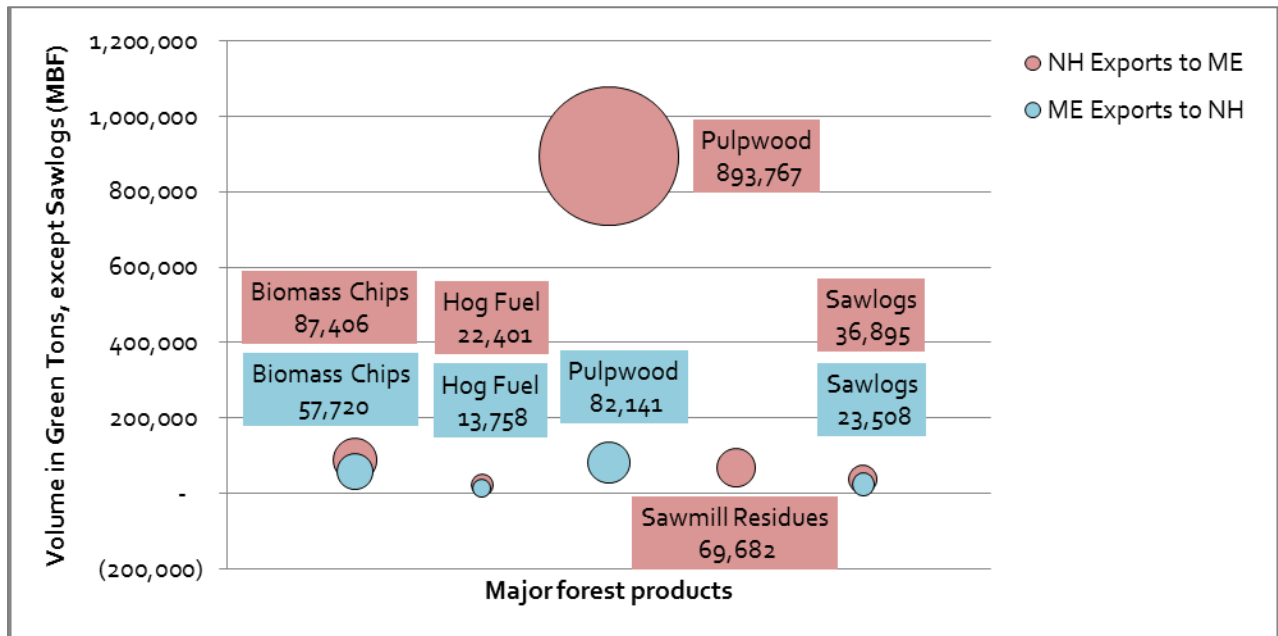


Figure 10 Major forest product wood flows between Maine and New Hampshire, 3-year average (2009 - 2011)

Biomass chips are “produced in the woods by chipping the entire tree, including branches and tops. Usually used as energy fuel, they may also be suitable for sludge composting, playground padding, and mulch.”

Hog fuel is defined as “any woody residue produced from mills, such as sawdust, bark or shavings, and used as energy fuel.”

Sawmill residues are defined as “clean, pulp-quality chips made from debarked slabs and edgings at sawmills. Used by pulp and paper mills to produce wood pulp.”

Pulpwood is defined as “roundwood that is used for the production of wood pulp. Generally sold as tree length, 16', 8' or 4' length.”

A sawlog is “a log that meets minimum standards of diameter, length, and defect, intended for sawing into boards or lumber. Includes sawlogs, studwood, pallet logs, boltwood, and veneer logs.”

Data and definitions from 2009 – 2011 Wood Processor Reports Including Import and Export Information. Department of Agriculture, Conservation and Forestry, Maine Forest Service, Forest Policy and Management, #22 SHS, Augusta, Maine 04333.

The picture becomes even more interesting when we zoom in to the county level. Data reveal that most of the volume of wood Maine exports to New Hampshire comes from the three closest counties: Franklin, Oxford, and York. Surprisingly, however, most of the wood New Hampshire exports to Maine does not necessarily end up in the closest counties; instead, it goes to the nearest counties with operational wood processing facilities, which include Androscoggin, Oxford, and Somerset (see Figure 11). These facts help illustrate the distances that wood must travel today to sustain the forest products industry. As mills close and markets tighten, the size of regional facilities’ woodbaskets has grown, quite literally stretching the industry to its margins.

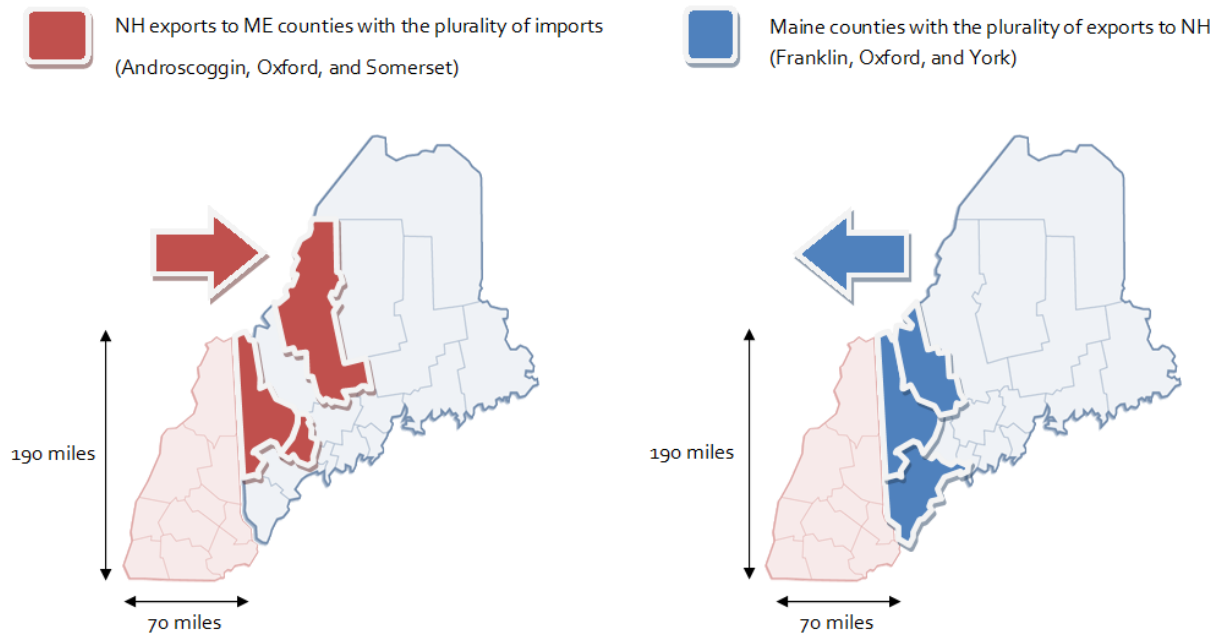


Figure 11 Maine and New Hampshire Wood Flow—3-year Trends (2009-2011)

Most of the wood that leaves New Hampshire for Maine travels to wood processing facilities in Androscoggin, Oxford, and Somerset Counties. Most of the wood leaving Maine for New Hampshire comes from the border counties of Franklin, Oxford, and York.

Data from Maine Forest Service, 2013.

Woodflow from forest to mill to consumer is highly complex, encapsulating tensions such as prices offered by competing sawmills, the price of diesel fuel, the value of wood at the stump (stumpage), the length of heating season, the new home construction market, and consumer decisions about local wood products versus cheaper, models manufactured overseas. When one tension piques, others must compensate to keep the wood flowing and maintain the balance of ecological, environmental, and social sustainability. When multiple factors flare simultaneously (e.g. extreme weather events, shortened logging season, exotic forest pests, decline in the construction market, shortage of young people entering the business), an incalculable complex of stressors jeopardizes the industry. Work days lengthen while profit margins diminish. Environmental corners are cut to get the job done on time and on budget. People are affected at every step along the supply chain – landowner, forester, logger, trucker, mill worker, secondary manufacturer, and retailer. There is no simple graphic that can accurately and comprehensively depict the full spectrum of players, products, and endpoints in this chain, much less the gravity of the stressors impacting each link. At the end of the supply chain, the party generally oblivious to this complicated story is the consumer.

Take, for instance, the 205-year-old spruce log mentioned earlier. The ultimate highest and best use of this log, or any wood product, cannot be taken at face value. While this particular log ended up as a valuable material for making musical instruments, in the words of the log buyer, it was *"very close to being worthless for any forest product at all. It is too big for the pulp mill. It is too big for any high production spruce mill. The big sawmill up this way has a maximum diameter of 19 inches, at the butt end! They could never even debark a log that big. A cut-to-length logging system would never have been able to harvest that tree. A regular mechanized crew with a feller-buncher also would not have been able to cut it because it was growing on a steep slope and the machine wouldn't have been able to do it. By chance, a hand cutting logger was on the job with a cable skidder, and we are a circular*

sawmill that can saw a log that big, although the sawmill manager absolutely hates to see a log like that. If I hadn't had the instrument market, we would have sawn it into 2X12s."

In this case, the wood supply chain was favorable for the highest and best use of this mighty spruce log. The landowner (White Mountain National Forest) was able to grow it to this mature state. The ground was favorable for the timber harvest operation, as was the harvesting equipment combination. The sawmill that purchased the log was able to mill it appropriately. A wood buyer had a special use for the log and was willing to pay the cost of transporting the log to its destination. And finally, there was a market for finely made violins and guitars. In examining the journey of this single log, it becomes evident that while this log was put to good use, a slip in any step of the supply chain might have compromised this happy ending. This interesting story also raises the issue of compatibility and capacity between the resource and the infrastructure. If the region continues regenerating primarily young forests, then it will not be able to sustain sawmills, only pulp and biomass. If the region is to have a diversity of mills and opportunities, then it must have a diversified forest.

The complexity of the wood supply chain and its role in the forest-based economy warrants greater discussion. The painful downturn of the forest products industry cannot be blamed on a single cause, but rather on the aforementioned complex of stressors plaguing wood products markets, forest health and management, and the socioeconomics of making a living in the industry. Therefore, solutions likewise cannot be found as a single approach aimed at mitigating the effects, but rather must be a complementary suite of solutions that directly address the root causes.

Rural economics

Rural economies in this region are dependent on the forest. Tourism and forest products remain the two largest industries in the Androscoggin Valley-Mahoosuc region. New Hampshire's forest products industry (wood products, furniture and related products, paper, forestry & logging, wood energy) contributes nearly \$1.4 billion to the state's economy. Forest resource-based recreation activities (cross-country skiing, hiking, downhill skiing, hunting, camping, snowmobiling, wildlife viewing, fall foliage viewing) also accounted for approximately \$1.4 billion. An economic model accounting for the multiplier effect on other parts of New Hampshire's economy estimated that the forest products sector supported \$2.4 billion in economic output and nearly 13,000 jobs (North East State Foresters Association 2013). In comparison, Maine's forest products industry contributed over \$5.4 billion annually, and forest-based recreation was valued at \$2.8 billion. The same economic model calculated a multiplier effect of \$8 billion in economic benefit and nearly 39,000 jobs supported by Maine's forest-based economy (North East State Foresters Association 2013).

Another daunting influence in the regional rural economic picture is the decline in wood products manufacturing capacity and a decrease in the number of skilled woods workers (Spong, 2010). The nature of wood products manufacturing has changed. In today's global markets, locally grown, locally manufactured wood products can compete with cheap, mass-produced goods from overseas through the innovation of mass-customization. Mass-customization individualizes mass-market goods to meet a specific customer need at an affordable price (Shultz 2006). There is a tremendous opportunity to develop a highly skilled woodworker workforce. In the realm of low-grade wood, a facility such as the Berlin Station biopower plant requires far fewer full-time employees than did the pulp mill. Such changes deeply affect the character of rural communities. *"People that I've met in Berlin, Groveton, they still are smarting from all those mills going out, from all those good, high-paying jobs that everybody had, and now there's nothing really. It's going to be really tough to*

replace that." Indeed, Berlin, "The City that Trees Built," would be a very different town without the forest products industry anchoring its existence. The Berlin Station Biopower facility and Gorham Paper and Tissue are the last vestiges of the heyday of the mill.

The number of woods jobs has decreased over time with the onset of mechanized timber harvesting. Surveys in the Northeast suggest that many loggers are approaching retirement age and that logging is perceived as a low-prestige career, both of which factors are leading to a decline the number of loggers (Egan, 2004). Other factors that make logging a difficult business include the high cost of fuel, insurance costs, equipment costs, and costs associated with workers compensation (Egan, 2009). Agreement was universal on the harsh reality of these challenges to the logging profession. One interviewee summarized the situation, *"I think the workforce is in terrible trouble because the age group – I just bought a new skidder for my son for my logging crew and almost puked. \$276,000 just for one piece of equipment on the logging job, and we're just on a small scale. Who in their right mind would go into that business?"*

Data corroborate the disheartening nature of this sentiment. U.S. Census data show steady declines in New Hampshire's wood manufacturing jobs, wood products manufacturing payroll, paper manufacturing jobs, paper worker annual payroll, and secondary wood products manufacturing jobs since the 1990s. Maine shows similar trends. Worker productivity has increased in terms of unit of value produced per person, but wages do not necessarily reflect these trends across all manufacturing sectors (North East State Foresters Association 2013).

The forestry profession itself is facing challenging times. As people disconnect from the working forest landscape, the public loses touch with the source of its furniture, fuel, paper, clean water and air, enjoyable weekend vacations, and the stewardship activities required to sustain all these values. As business costs rise and demands for environmental accountability increase, less time can be spent actually doing good work on the ground. For instance, even the White Mountain National Forest has been experiencing a long-term downward trend in the number of timber harvests and capacity for overall forest programs due to declining budgets and staffing cuts. The Forest has been offering less than half of its allocated Allowable Sale Quantity, and this downhill trend is expected to continue. Of the many demanding elements of the multi-use mandate of the White Mountain National Forest, the foremost forest management goal "is to provide high-quality hardwood logs for the future. Silviculturally, what we have been doing for the last 25 years is removing low-grade stuff. When we do that, our profit margin is lower because we're not selling any of the high-value stuff, we're growing it," described an interviewee. *"Then the below-cost timber sale issue reared its head, and some people started using that as justification for stopping harvests from federal land. Now that it's time to recoup the investment we made and make a profit, some folks say, 'Oh no, that's too nice; you can't cut that.'"* While it is beyond the scope of this report to fully address the debate over forest management on federal lands, it is clear from an ecological standpoint that if public outcry continues to prevent good silviculture and management, the forests will be in serious trouble.

Challenges to management on the White Mountain National Forest and other large ownerships deeply impact the well-being of local communities. A sustainable forest landbase is the cornerstone of the rural economies and natural heritage treasured by residents and visitors to this region. Landowners and forest-based industries must support sustainable forestry to shape a positive future for communities in the Northern Forest.

Analysis

Challenges

The Androscoggin Valley-Mahoosuc region faces countless challenges to the sustainability of its forests, forest products industry, and rural communities. Changes in land ownership have fed a disconnect between people, the land, and the businesses that once tied communities together. On a smaller scale, second home owners in areas around Bethel, Maine chip away at traditional land uses. The real estate market is not favorable to landowners who wish to keep working forests as working forests.

On a brighter note, the forests itself has proven to be incredibly resilient. Despite years of mixed treatment across the landscape, the forest resource has continued to grow and adapt. However, resiliency is not infinite; there are no guarantees that the forest and communities dependent upon it will continue to survive, let alone thrive, under the current trend. The challenge to forest stewards – landowners, foresters, loggers, wood products consumers, and visitors– is to promote and practice forestry activities that enhance the long-term sustainability of the forest. Society benefits when timber harvests address the ecological needs of the stand and work in concert with the availability of local wood markets. As wood markets constantly shift, however, it can be challenging to maintain a sustainable balance between ecological, economic, and environmental objectives in a timber harvest. An interviewee observed that *"many harvest operations are driven by economics and not necessarily silviculture."* This approach creates a danger of losing healthy, diversified forests, wildlife habitat, ecosystem services, and other values.

Wood products markets have been challenged in recent years by mill closures, a diminishing skilled workforce, and consumer preferences for cheaper goods manufactured elsewhere. With such market conditions, it is difficult for a landowner, large or small, to grow and harvest trees in a way that maximizes the short-term and long-term potential of the resource while meeting ecological and social values. Standards for sustainable forestry can become compromised when a complex of stressors is at play; the challenge ahead is to ensure a path for sustainability in spite of stresses – one that promotes healthy, vibrant forests, and supports the forest-based economy and communities.

Simply put, a suffering economy puts stress on the environment. For example, one interviewee described an increasingly common attitude toward productivity versus environmental impact: *"In the woods, you still see big ruts, maybe more than you should, but you've got to finish out the season. When it comes to the paycheck first, it's 'one or two more days,' or 'I should get out, but I need a few more twitches.' It's not being preached like it was, so it's not being practiced."* The people who make such decisions are challenged to uphold an environmental ethical standard in the face of adversity. Where the rubber hits the road, it is becoming increasingly difficult for some to consistently do the right thing.

Strain on the economy and the forest, in turn, stresses the people that live and work in the forest and impacts the quality of life; the culture becomes one of metaphorically pinching pennies and tightening belts to survive. *"People live a little less than what they were living, so they're keeping less margin on everything,"* articulated one interviewee, *"Everybody's got that get-by attitude, and you have to sometimes, but you can't do it forever."* Forests, forestry, and forest-reliant communities of the Androscoggin Valley-Mahoosuc region are not new to challenges. In fact, challenges call forth the strength and resiliency that characterize the very nature of the people and the land. Because of this, the region inherently professes the potential to embrace the challenges of today, seize opportunities, and redefine itself for a stronger tomorrow.

A Vision of Vibrant Forests

It is still possible to create a vision of vibrant forests for a region in response to the data showing unsustainable harvesting and declining rural economies. The thoughts below have been expressed by leaders in the Androscoggin Valley-Mahoosuc region and could serve as a foundation for a unified vision for the state of the region's forests, forestry practices, forest products industry, forest-reliant communities, and integrated value streams that contribute to the holistic well-being of people and place.

- The region's forests should be managed to sustain the composition, character, and capabilities that deliver direct benefits to people in Northern Forest communities: wood products, energy, recreation, clean water and air, and conservation values.
- Because the landscape is largely privately owned, landowners may need incentives to motivate them to provide these values. In turn, a healthy forest products industry embedded in the right supply chains may demand good forest management practices from landowners with balanced objectives of sawlog and fiber production.
- This landscape is capable of growing a diverse mix of wood products with multiple benefits to forest users despite having been a wood basket for pulp markets. The region would greatly benefit from increased market opportunities for long-rotation, high-quality hardwood sawlogs to increase uneven-aged management.
- To develop such market opportunities, the region needs to support and capitalize innovation, adaptability, and strong business models. There is a tremendous opportunity to develop a highly skilled woodworker workforce.
- Strong local wood products markets depend on customers that are willing and able to pay for homegrown goods and all the values that the forest resource provides. Opportunities exist to promote local wood markets within the region.
- Fundamentally, a vibrant forest-based economy is dependent upon a sustainably managed forest resource, strong markets for a diversity of wood products, and communities that can use and value their natural assets.

Opportunities

A vision of vibrant forests lends itself to identifying opportunities for working toward that vision. The region supports a resilient forest and tough people that have survived sweeping changes to "the way things used to be," and exhibits the strength of character needed to address current challenges to its forests and forest-based economy. In this innate resiliency lies an opportunity to capitalize on this strength and reverse the painful downward trends affecting the forest resource and the communities dependent upon it. The challenges are many and varied, and likewise, an achievable, effective suite of solutions must address both the underlying causes and the effects of the stressors on the region's forests. Many passionate individuals and mission-driven organizations are at work improving the lives, livelihoods, and well-being of rural communities tied to the state of the forest. An opportunity exists to foster improved communication, collaboration, and action with an integrated focus on the forest resource that is at the heart of the region and people.

Communication

A key to achieving a vision of vibrant forests is improved communication on several fronts. Without one “Great Provider”-like company dominating the local fabric, better communication is needed from large landowners about the challenges they face and how they affect traditional forest use. Managing forests is not as lucrative as it was in the past; today, conservation easements, wind turbines, and biomass harvests contribute to offsetting the costs of road infrastructure, forest certification, and high stockholder expectations. There is also an opportunity to better communicate success stories of high-quality management so that the elements that make them successful might be replicated. For example, the White Mountain National Forest practices exemplary silviculture in the face of demanding public standards and financial limitations, but this achievement is not common public knowledge. Innovative mills find ways to stay afloat for decades while others fall by the wayside. The lessons learned should be celebrated as a source of inspiration and as a resource for ensuring sustainability. Such lessons transcend borders. *“It’s interesting with the state line here, too, because we don’t see it as a barrier, but it is a barrier for some communities,”* described an interviewee. *“It’s always surprised me when I’ve met towns that often don’t know the next town, particularly when they don’t rely on each other for mutual aid or mutual agreements. There’s great information out there, but there’s not as much sharing and collaboration as there could be.”*

As woodland owners age and land changes hands, many small woodland owners have become disconnected from the benefits of managing forests, and forests are often converted to non-traditional uses. Communication for and among woodland owners could be enhanced to engage small woodland owners in proactive woodland stewardship. Such communication could also introduce woodland owners to the local economic benefits of managing their forests and producing firewood, biomass to heat local schools, and high-quality wood products.

At the same time, communication is needed to ensure that ethical forest practices are upheld to benefit the forest resource and the people that live, work, and recreate in the rugged northern forest landscape. A better understanding of how choices impact the land can help direct the moral compass that guides individuals when faced with difficult situations in which the land – and the people that depend on it – are at stake.

The region is home to the Coös Networks, a forum for interaction between leaders across sectors. This forum provides the perfect opportunity for organizations to clearly identify their roles and collaborate to advance forest stewardship for the benefit of the rural communities of the North Country – Berlin, Gorham, Colebrook, Lancaster, Errol, Bethel, St. Johnsbury, and everywhere in between. As one interviewee articulated, *“What I see still is that there doesn’t seem to be a good, cohesive, strategic plan between the regions. I’m not seeing a lot of collaboration on what the vision is for the region. Is it on forest-based economy and wood products, or is it more tourism-based? It’s about bringing those regions together and having a united strategic plan. And because it’s missing, I think there are some opportunities that are being lost.”* With this local network of leaders already in place, the greatest opportunity is that of working *together* to achieve common goals for the betterment of the greater region.

Community Forests

A prime example of working across sectors to achieve collective impact is community forests. Community forests are a model for local forest ownership and a community investment strategy that promotes economic and community development while conserving working woodlands. Community forests are established or in

progress in this region at Errol, Milan, Gorham, and Randolph, New Hampshire; Bethel, Maine; and other locations across the broader Northern Forest region. Often community forests provide ecological benefit by buffering or linking to other conserved lands, and by ensuring sustainable management through conservation easements. They ensure local (municipal) ownership both politically and socially, building social capital and community capacity for education and recreation. Furthermore, local ownership leverages local financial support and ensures that the community will own and remain invested in this natural asset (Community Forest Collaborative 2007). In the words of one interviewee, *"it's a great alternative to other ownerships which don't have the local control, and it would give the region a better opportunity to control its destiny."* Some suggest that federal dollars spent on a wildlife refuge or a federal prison might have been better invested in community forests. For instance, a new study of the economic impacts of Errol, New Hampshire's 13 Mile Woods found that sustainable management during the first seven years of community ownership of this forest generated more than \$1.7 million in net timber revenue and over \$2 million in earnings in the logging sector. This single forest also supported two full-time equivalent jobs in forestry and logging and indirectly, ten additional jobs in forest products manufacturing each year. This community forest is a cornerstone of the region's recreation-based tourism industry; 13 Mile Woods contributed to the \$2.2 million Errol's tourism revenue in 2012 and over 20 jobs in Errol being supported by recreation-based tourism (Reaves and Ceroni 2014).

It is clear that resources successfully invested in community forests produce a multiplicity of benefits to forests, local economies, and communities. Community forests perfectly model the value of collective ownership of the forest resource.

Private Forestlands

Private forestlands dominate the regional landscape; therefore, the greatest opportunities to positively shape the state of the forest must involve the owners and managers of private forestlands. On the industrial scale of ownership, societal expectations drove significant investment in third-party forest certification of private forestlands. An equally monumental motivator would be required to affect management of private forestlands in the region. As stated earlier, private forestland owners and managers must be part of the conversation.

For private individuals interested in owning and stewarding non-industrial woodlands, purchase costs are a barrier to conservation ownership. This motivation could be capitalized upon to the benefit of the forest resource. Affordable, community-supported mechanisms would need to be devised to overcome the cost barrier. Community forests and WFCEs are existing conservation tools with successful returns on economic and social investments. Policy tools could be explored as well to stimulate greater investment in conservation ownership by private individuals.

Local Wood

As people say, "Local wood does local good." Indeed growing, processing, and consuming wood locally greatly simplifies the complexities in the wood supply chain. Transportation costs are diminished, local jobs benefit, and the multiplier effect increases the local economic benefit. With fewer tensions at play, the forest may be treated less roughly, benefiting the ecological integrity of the system and helping ensure its long-term viability. The social, economic, and ecological benefits are appreciated locally, multiplying social capital and generating value and pride in communities' natural assets. The local wood concept maximizes local investment and local benefits and provides a ripe opportunity for future investment in regional sustainability. Even a fractional increase in high-end manufacturing jobs would reduce dependence on commodity wood and globalized markets and return that economic investment locally with benefits to rural communities.

Many opportunities exist to increase the significance of local wood. Secondary wood products could be produced, bringing the value-added component of the wood supply chain closer to home. Some people interviewed for this report suggested a locally held small kiln for use by local furniture makers, or of tapping sugar maple trees on federal roadless lands to satisfy the growing maple syrup niche market. The region needs good jobs that can truly support families; the local forest products industry provides a great opportunity for developing a skilled workforce. Manufacturing jobs that utilizing locally grown hardwood could help drive long-rotation silviculture. The region offers a great opportunity to market both the wood products and the local economic and ecological benefits.

Community-Scale Biomass Heating

An opportunity certainly exists to heat homes with renewable resources grown right within the Northern Forest region. A pellet boiler manufacturer and multiple wood pellet producers are located right in the region, providing a locally produced, safe means of heating homes in the cold climate. Community-scale biomass projects heat schools, hospitals, and community facilities such as the Androscoggin Valley Hospital and St. Kiernan's Community Center for the Arts in Berlin, New Hampshire. Harvesting and utilizing this low-grade wood locally benefits both the forest and the community. The Northern Forest Center's Model Neighborhood project is helping families switch from oil to wood pellets. From February 1, 2012 through March 14, 2014, a pilot project in Berlin, New Hampshire helped save nearly \$100,000 in fuel costs and recirculated nearly four times this amount in dollar impact to the local economy (Northern Forest Center 2014).

The region offers a promising forest resource that is the basis of rural lives and livelihoods, but the ties between forest-based economies and community well-being are gradually weakening. *"Coös County has its forests. You have that, which a lot of places don't have, but we don't seem to be using it in a way that allows a lot of people to live here."* Action is needed to take advantage of these opportunities and realize the potential of the region.

Conclusion

Forest inventory and economic data show that the Androscoggin Valley-Mahoosuc region has the potential to grow, harvest, and market greater value in its forests than it has historically. However, the region has yet to shift wood markets and silvicultural practices away from a pulp-focused ideology toward the inclusion of high-value products. Consequently, there is an unnatural imbalance of size classes across the forest landscape. The current overall harvest rate in excess of growth on private lands is not sustainable over the long term. At the same time, neither is it sustainable for the White Mountain National Forest to harvest less than half of what has been designated in its Forest Plan.

The forests of the Androscoggin Valley-Mahoosuc region have demonstrated the ability to grow high-value forest products, bringing ecological and economic benefits to the people of the region. Meanwhile, the market for low-grade wood presents silvicultural opportunities to improve forest conditions if done so sustainably. A healthy, diversified forest goes hand in hand with a balance of market opportunities. If current conditions are addressed, this region exhibits the potential for sustaining local economies and forest-dependent communities.

Perceptions of the long-term viability of the forest resource are mixed; while much of the landscape experienced the same past treatment, some acres seem to be managed well while others seem to be growing in spite of, rather than because of, current management decisions. Regulations and voluntary third-party

certification have generally (though not everywhere) improved the state of the forest, and opportunities exist to enhance these and other avenues for ensuring regional sustainability. On private lands, engaging landowners could contribute to across-the-board increases in sustainable forest management practices. Working forest conservation easements have helped stabilize the ownership, management, and future of much of the land in the region and the people working in the forest products industry. Consumer preferences for local wood would fuel the local, forest-based economy.

The lives and livelihoods of people in communities are inextricably interwoven with the state of the forest and the forest-based economy. Tougher conditions make it difficult for the next generation to make a living in the forest products industry. Forests in the Androscoggin Valley-Mahoosuc region are resilient and, if treated well, have the potential to survive and, in places, even thrive. If we take a long, hard look at the future, great opportunities exist to advance a deeper stewardship of the region's forests.

"I think that's the backdrop; it's the landscape, it's the mountains, it's the rivers. I think there's a huge amount of potential in this area. If we could agree on what those milestones are, there's a lot of different entities working in this area – the land trusts, the communities, the businesses – I think the struggle we have is, how do we work together?"

Appendix: Interviews

The background data presented thus far paints a technical picture of the state of forests and forestry in the Androscoggin Valley-Mahoosuc region. However, the true state of forests and forestry in the region is intertwined with the knowledge and experiences of the people who live and work in those forests. The insights offered by these individuals may or may not be factual, but are essential to our understanding of the past, present, and future of the forests of the Androscoggin Valley-Mahoosuc region.

The more than 30 interviewees included foresters, wildlife biologists, municipal planners, mill owners, loggers, recreation organization leaders, land trust and regional conservation organization leaders, community leaders, and other individuals. Conversations included themes from the following questions:

Interview Questions

1. Silvicultural trends. What sort of silviculture is common in the region (not necessarily on your land)?
2. Programs and practice. Do you think state-issued BMPs, certification, Master Logger, Tree Farm, and other such programs improve management in the region?
3. Growth and harvest rates. How do growth and harvest rates compare across the region (cd/ac/yr)? Are you studying this on your land?
4. Pressures. What do you see as the biggest pressures on the forest now? In the future? For example, how do local economy & tourism, biomass, the global economy, climate change ecosystem adaptations, and other such factors affect the practice of forestry in the region?
5. Are the woods "OK?" Do you think the forests in this region are ok in terms of forest condition vs. wood supply? Is there something that needs to be done?
6. Is the forest industry "OK?" How is the forestry industry in the region? What does the current and future workforce look like?
7. Biomass markets. Are you optimistic about the potential opportunity for biomass markets? In what way?
8. Land ownership trends. How do you feel about trends in land ownership and use in the region?
9. "New" developments. How might "new" recommendations or developments influence the condition of the forests and forest industry in the region (e.g. the Forest Guild Biomass Harvesting Guidelines, payments for ecosystem services)?

Interview Theme Summaries

Based on the questions above, the following themes emerged through these conversations. Again, while not all can be taken as straight fact, they do illustrate the local picture of what is going on in the woods.

1. Silvicultural trends

- The region's forests are resilient despite inconsistent silvicultural treatment through time and across the landscape.
- Due to past forest management, treatment of the forest has been generalized as "rehabilitation silviculture."
- Across the landscape of different ownership types, the region's forest is dominated by a two-aged structure.
- Longer-rotation forestry is uncommon, although there is some fostering of older age-classes and higher products through silvicultural treatments such as crop tree selection.
- The legacy of the pulp and paper industry is still strong in the region's forests. The woods illustrate a common landowner objective of growing volume, not necessarily quality.
- The average small ownership is not being managed, or not being managed well, for a number of reasons external to the capacity of the land itself (e.g. landowners have higher priorities in other areas of their lives; landowners do not see a need to involve a forester or have a plan; there is a lack of strong, local wood markets; etc.).
- Public lands are generally seeing more thoughtful treatment than surrounding private lands in the region.
- Private lands can be managed for diversity in both age class structure and product value when the landowner has these silvicultural or market goals in mind.

2. Programs and practice

- Laws such as the Weeks Act and Forest Practices Act have provided great benefit to the forest landscape over time.
- Where implemented, BMPs have proven effective. Where BMPs go unenforced, forest soils and water quality can undergo lasting damage in a short period of time.
- The spread of logger certification has been good for the woods and good for loggers' safety and marketability.
- Third-party certifications have had mixed effects on on-the-ground forest management practices. Both SFI and FSC call for more rigorous thinking and documentation of management decisions. However, not all third-party certified lands are universally viewed as being sustainably managed. Certification systems have not driven a widespread market demand for sustainably sourced wood products.
- Current use (NH), Tree Growth (ME), the American Tree Farm System, and NRCS cost-share programs have been beneficial to small woodland ownerships in that they require a forest management plan and the involvement of a licensed forester.

3. Growth and harvest rates

- The adage of an average of half a cord per acre per year is deceptive in its simplicity. Variability exists from ownership to ownership, site index to site index, in the land's ability to grow trees as well as the owner's capacity for harvesting at growth. Likewise, the question of what is sustainable varies from site to site.

4. Pressures

- The most widely recognized pressure on the forest is the short-term economic goals of certain large landowners in the region, which are perceived as translating into short-sighted forest management, short-term land tenure, and scant interest in the communities tied to the land.

- From the large landowner perspective, pressures that inhibit their capacity to manage forests well include increased accountability to the public and through standards such as certification.
- Development pressure, though in a lull, is still perceived as a threat to the forests of the region.
- Another pressure identified is the influence of decisions made by people outside the region, whether Wall Street investors, second home-owners, or hikers or leaf-peepers.
- Within the forest industry, the legacy of the historic lens of forest management primarily for the pulp and paper industry influences the practices of foresters and loggers of today. The change in wood products infrastructure has greatly affected any assurance of markets for wood long-term management.
- A related pressure is the current lack of market demand for both high-quality (long-rotation) and low-grade materials (whose removal would promote the overall forest condition).
- Owners of small woodlands are typically older and have not made plans for the future of their woodlands. As the Greatest Generation and Baby Boomers graduate into older age classes and let go of their lands, the management of those lands could change significantly without woodland legacy planning.
- Another ill-addressed pressure is children's disconnect from the forest and forest products industry.
- In communities throughout the region, there is pressure to maintain a balance between forest sustainability and the natural resource-based economy.
- Invasive species are not yet rampant in the region, but are being watched as a future threat to forest health.

5. Are the woods "OK?"

- The woods are "OK," but not great, and it varies from ownership to ownership.
- A good deal is at stake in future wood product markets following the decline of the pulp and paper industry. People in the forest products industry are increasingly hard-pressed to make a living, which in turn increases pressure on the forest.

6. Is the forest industry "OK?"

- Short-term economic gains are not only bad for the forest, they are bad for jobs in the forest-based economy.
- Logging is an increasingly tough profession.
- Local wood products manufacturing brings/brought jobs; the absence or departure of such businesses creates a disconnect with the regional industry and is tough on the local economy.
- Good silviculture and long-rotation forestry pays, as is exhibited by the White Mountain National Forest.
- Communities such as Bethel, ME and Berlin, NH are resilient as the forest. They are working to redefine themselves as the economic balance shifts from the forest products industry to recreation-based tourism.
- There are wood products businesses that are holding on and even have potential to grow.
- The Androscoggin Valley-Mahoosuc region needs sustainably managed forests with diverse age class structures and the ability to produce a variety of products. With this, it could provide for locally-based wood products businesses that would in turn draw and maintain a skilled workforce in the area. These pieces would promote economic development linked to local wood products.

7. Biomass markets

- Biomass could fill the need for a low-grade product market, but some conjecture that prices would need to be more competitive to make it economically feasible.
- At the time of these interviews, the Berlin Station biopower facility was predicted to almost certainly impact the pulp market. Some predict that this will drive up the cost of wood.
- Berlin Station will also almost certainly affect forest management in the surrounding woodbasket. There is some concern that it will motivate loggers to invest in costly chipping equipment that takes many loads to pay off. There is greater concern that the existence of this facility will once again promote silviculture centered on volume more than quality of wood. The biomass market may also encourage an increased utilization of smaller and smaller wood and simultaneously, a decreased efficiency in utilization of larger wood (i.e. higher-grade materials used as chips). This change in utilization standards may also affect the amount of downed woody material retained during timber harvests.
- Large land managers have included biomass in their product mix for decades, and those interviewed did not expect to dramatically change their silvicultural practices with the availability of this new market.

8. Land ownership trends

- As one interviewee put it, “The time horizon of the landowner is the best indicator of who's going to do good forestry and who's not.”
- Shorter time horizons and frequent changes in landowner goals and management styles tend to lead to repeated resource extraction and negative impacts to the forest.
- Long time horizons frequently include long rotations, a greater diversity of products, and known players in wood products markets.
- By far, the most concerning ownership trend is the prevalence of TIMOs and REITs.
- Community forests are long-term ownerships and are beneficial to towns.
- Public ownership, whether at the local, state, or federal level, is largely considered beneficial to the local communities that have a stake in the success of these lands.
- Conservation easements are good for the long-term future of the landscape, but conservation buyers are challenged by over-priced lands. A change in public values has contributed to a rise in interest in conservation ownerships.
- Development has slowed, but the high prices of forested lands in both the small and large ownership categories leave the future unpredictable.

9. “New” developments

- “New” programs, practices, and other developments have had mixed impacts on the region’s forestland. The greatest universal challenge has been sustaining positive programs through time (e.g. Mahoosucs Initiative, Northern Forest Lands Council).
- Large landowners are not likely to be interested in developments in forest practices (e.g. payments for ecosystem services, biomass harvesting guidelines, carbon markets) without economic incentives.
- For smaller landowners, educational programs can enhance woodland management.
- Opportunities exist to reach out in new ways to the public and educate people about the importance of forests to the Androscoggin Valley-Mahoosuc region.

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