

Value Chain Workshop Brief: Wood Energy

Introduction

The Working Lands Enterprise Board (WLEB) is conducting a systems analysis of Vermont's Forestry Industry to identify opportunities for strategic investments to support and grow this important sector of Vermont's economy. The goals of this work are to identify the most promising opportunities and build relationships within the sector (and beyond) that contribute to prosperity for all participants. The Working Lands Enterprise Board will be using the results of this work to prioritize policy and investments in the wood products industry. Identified strategies will be presented in June at a Statewide Summit of the industry.

The material in this document comes from three separate activities conducted by Yellow Wood Associates as part of the systems analysis work underway (secondary data analysis, key informant interviews, and focus groups). The reports resulting from these activities were all prepared as internal documents for WLEB and are in draft form. Some of them include comments from members of the WLEB committee. This brief includes excerpts of material that seem most relevant to the wood energy subsector. This information is provided to you as a participant in the upcoming value chain workshop and is not intended for broad dissemination.

We are sharing this material with you not because it is definitive, but because reading it may stimulate your own thinking with respect to emerging market-driven opportunities in the thermal wood energy arena that could be captured by many Vermont firms working together. We will not be spending our time in the workshop debating this information; rather we will be counting on you to provide your own ideas and perspective.

The three sections in this brief are:

1. Part One: Wood Energy, from *Draft Report on Secondary Research*, an internal report on market trends;
2. Part Two: Opportunity: Addressing Demand in Wood Energy Markets, based on secondary research and key informant interviews with industry players inside and outside Vermont;
3. Part Three: Positive Developments and Challenges in Vermont, based on four focus groups held in different parts of Vermont in November and December, 2014.

Part One: Wood Energyⁱ

There are three types of wood energy being used in mainstream markets today: firewood, woodchips and wood pellets. Firewood is burned mostly at the residential level, but is also used for cooking in restaurants. Woodchips are usually generated as a byproduct of other activities and come in a range of gradesⁱⁱ to meet the needs of large electric-generating plants like McNeil in Burlington to high efficiency wood chip boilers heating institutions like the National Life Building. While firewood and woodchips are essentially raw wood products, wood pellets are made from roundwood and sawdust, wood chips, lumber mill scrap and other wood byproducts. While wood pellets continue to be made of the same material, wood pellet technology has evolved so that they can be burned not just in small-scale residential stoves but in institutional-size boilers.

Demand for Wood Energy

National and International Demand

A 2013 report on the state and future of the U.S. forestry industry, like others, indicates that there has been significant growth in the wood energy sector, driven primarily by the adoption of renewable energy standards in European Union (EU) countries.¹

In the United States, two types of projects have led growth in the U.S. wood bioenergy markets since 2010: industrial combined heat and power (CHP) plants (using the heat/power for their own manufacturing or selling it to neighboring facilities) and pellet plants targeting domestic and export markets.

Federal or regional carbon emission regulations and/or federal and state energy policy incentivizing the use of biomass for thermal energy would increase the technological advances and demand for wood pellets.

Wood pellet manufacturing and consumption began in the United States more than 25 year ago and the industry has grown steadily since then with a recent acceleration in response to rapidly rising fossil energy prices.² Wood pellet technology, both in the make-up of the pellets and in the boilers used to burn pellets, is in a period of rapid development due to the rise in heating fuel prices and increased demand for renewable thermal energy.³

Vermont and Regional Demand

Wood as a main heating source in homes has gained popularity in many areas of the country in recent years, but the increase is most notable in the Northeast. All New England states saw at least a 100% jump from 2005 to 2012 in the number of households that rely on wood as the main heating source.⁴

ⁱ Information in this section excerpted from *Draft Report on Secondary Research* an internal report on market trends.

ⁱⁱ The Biomass Energy Resource Center (BERC) has developed a guide to woodchip fuel, considered an industry standard, that identifies four grades of chips: Grade A) Clean, Mill or Paper-Grade Chips that come from Sawmills and Chip Mills; Grade B) Bole Chips from Chip Yards; Grade C) Whole Tree Chips that come from chipping of tops and limbs (usually in the woods); and Grade D) Urban-Derived Wood Waste Chips from wood recycling yards, arborists and municipal tree-care. Most institutional users of woodchips require Grade A chips to operate their boiler systems; the lower-grade chips can be used in a range of woodchip technologies resulting in process heat or generating electricity.

A 2012 assessment of Vermont wood fuel markets identified 2 electric utility plants (using 42% of Vermont's wood fuel), 12 industrial heat and process steam plants (2%), five industrial and institutional co-generation plants (4%), 58 institutional and commercial heating sites (both woodchips and pellets) (3%) and 81,000 households using firewood (49%); a 2009 study also identified 7,000 households using pellets.^{5,6} The use of wood for energy in Vermont increased 7% between the 2009 and 2012 and 11% between 2005 and 2012.⁷

Approximately two-thirds of Vermont's total energy usage is for thermal heating. In order to meet the state's goal of 90% renewables by 2050, the state's current Comprehensive Energy Plan calls for the support for, and increased use of, renewable sources of heating, including biomass.⁸ While Vermont is known as a leader in the deployment of biomass in schools and public buildings and has long been seen as a leader in promoting biomass heating in the United States, only 4% of the state's heating demand is met by renewable sources. In the fall of 2013 Vermont formed a partnership with Upper Austria, where close to half of all heating demand is met with renewable sources to promote biomass heating.⁹ This partnership as well as policies and incentives designed to help meet the state's renewable energy goals will likely increase the demand for biomass energy in Vermont.

Woodchip demand in Vermont is dominated by the McNeil generating plant which consumes 76 tons of woodchips an hour when operating at full capacity. The bulk of woodchips come from upstate New York with additional fuel coming from Vermont.¹⁰ In addition to McNeil, in the 2010–2011 heating season, 43 Vermont schools operated woodchip heating systems consuming approximately 25,420 green tons of chips (an increase of 7% from the previous year) and 17 facilities used woodchips in industrial or institutional thermal or cogeneration capacities.¹¹

Vermont Business

Colton Enterprises operates a mill that processes hard wood logs into firewood and has three new, state-of-the-art efficient dry kilns built to dry firewood. The kilns have the capacity to dry 250 to 275 cords of firewood a week and are fired by sawdust and chips generated from the splitting process. Colton Enterprises is now Vermont certified for "heat treating" firewood ensuring that kiln-dried firewood is bug and pest free, and is now certified to legally transport their kiln dried firewood to areas that are quarantined for invasive species such as the emerald ash borer and the Asian longhorn beetle etc. Located in Pittsfield Vermont, Colton Enterprises delivers to most areas of Vermont, New Hampshire, Massachusetts, Connecticut and Eastern parts of New York – outside of a 70 mile radius there is a minimum delivery of 7 cords and the company has the capacity to deliver 15–16 cords via tractor trailer. Colton Enterprises sells retail firewood in Vermont (including to restaurants that like to cook on it) but the majority (60–70%) of Colton Enterprise's kiln-dried wood is sold wholesale in the Boston area and Eastern Connecticut (where Colton Enterprises works with a dealer called "Vermont Good Wood"). Due to Vermont regulations, Colton Enterprises is not able to operate its kilns in the summer. Demand for kiln-dried firewood continues to grow and Colton Enterprises is able to offer its employees benefits such as health insurance, vacation time and retirement.

(<http://www.coltonenterprises.com/process.htm>)

Vermont schools are served by 14 woodchip suppliers including five sawmills, two brokers, six woodchip producers and 1 landscape mulch producer.¹² While the cost of woodchips has remained relatively stable over the past decade, prices are likely to go up as lower log prices have caused some private landowners to hold onto their timber leading to a decrease in supply and increased competition for low grade wood.¹³

Wood Energy Data and Trends

Production of woody biomass for fuel is projected to increase between 53% and 357% between 2006 and 2030 based on three projection scenarios analyzed in the North American Forest Sector Outlook Study.¹⁴ While the feed supply for this market has traditionally come from by products from other sectors and waste materials, new mills with the capacity to produce 1 million tons or more are being sourced with forest management and small diameter trees that have traditionally supplied the pulpwood and oriented strand board (OSB) markets.¹⁵

Firewood

Firewood represents about a third of the total amount of wood cut in Vermont.¹⁶ The large majority of the firewood produced in Vermont is harvested, processed and sold locally for residential use, but there are producers that have larger firewood businesses that sell firewood at retail in state and wholesale out of state. Firewood is measured by the cord and is sold green, seasoned or kiln-dried. A study looking at Maine stumpage prices over the past 50 years showed an increase in value from \$2.96 per ton in 1984 to \$7.60 per ton in 2009.¹⁷ A Johnson Company currently has green firewood for sale at \$310 per cord and kiln-dried firewood at \$370 per cord (approximately \$106 per ton for green wood and \$128 per ton for kiln-dried).ⁱⁱⁱ

Wood Pellets

A growing segment of the industrial wood products sector is wood pellets, which utilize roundwood sawdust and other wood waste to heat and power plants. Europe, converting from coal to eco-friendly wood, bought 1.7644 million metric tons of pellets from the U.S., the No. 1 supplier^{iv}; Canada supplied 1.346 million metric tons.

Opportunities and Challenges

Opportunities

Institutional woodchip heating systems like the one at Middlebury College provide a great opportunity for biomass education as well as consistent demand (the college requires that all woodchips be sourced within a 75 mile radius of the college and works with Cousineau Forest Products, located in Maine).

ⁱⁱⁱ Assumes 1 cord of hardwood is equivalent to 2.9 tons.

^{iv} Wood pellet exports from the United States nearly doubled from 1.6 million short tons in 2012 to 3.2 million short tons in 2013 – 98% of pellets were exported to Europe. Source: U.S. Energy Information Administration. “U.S. wood pellet exports double in 2013 in response to growing European Demand.” May 22, 2014.

The greatest pellet production in the United States remains in the Northern part of the country for residential heating; however the landscape is changing with the expansion of large-scale pellet facilities in the Southern region that are targeting the export market.¹⁸

While the majority of wood pellet exports are currently produced in, and shipped from, the Southern region, Maine has been investing in port infrastructure which will allow pellets to be shipped from the East Coast. The port of Eastport in eastern Maine has been undergoing expansion including the installation of a conveyor system capable of handling bulk commodities and it is expected that wood pellets will be added to the list of exports in 2014.¹⁹

Several Maine businesses have plans to export pellets to Europe, including F.E Wood & Sons, which is in the process of transforming their business to produce up to 300,000 tons of pellets for export (connected to the Eastport port) via rail. Thermogen Industries plans to build a torrefied wood pellet manufacturing facility in Eastport and ship directly to Europe from there. And, Corinth Wood Pellets plans to export pellets to Europe from Searsport in 2014.²⁰

Torrefied pellets (where the biomass is heated in a no oxygen environment, produces a pellet that has twice the energy content of other current pellet fuels, has lower emissions and produces no smell or visible smoke) are being considered as a suitable option for the replacement of coal in coal-based operations as well as for use in other types of equipment that currently burn wood pellets; because they are less bulky, they have significantly lower shipping costs.^{21,22}

Curran Renewable Fuels based in Massena, New York was the first pellet manufacture to produce FSC certified pellets. There is not currently information on demand for FSC certified pellets.

Vermont is home to one wood pellet manufacturer, the Vermont Wood Pellet Company, which opened in 2009 in an abandoned pallet factory in Clarendon. The Vermont Wood Pellet Company produces more than 15,000 tons of super-premium softwood pellets annually. Chris Brooks, a co-owner of the Vermont Wood Pellet Company, believes that this small-scale pellet factory could be replicated throughout the state working with a woodshed within 50 miles of the plant and distribution to customers 75 miles from the plant.

Other pellet plants have been proposed in Vermont but are not yet a reality.

Challenges

Pellet makers compete with panel producers for fiber, often driving up prices.²³

While the regional wood pellet market is still dominated by bagged pellets for small-scale residential pellet stoves, there is a shift underway to residential, commercial and industrial pellet boiler technology (including residential central heat, commercial/industrial boilers, district heating and combined heat and power facilities). These technologies rely on bulk-pellet delivery and storage that makes a pellet boiler a reliable primary heat source for residential, commercial and institutional facilities while reducing waste and delivery cost.²⁴

There is concern that as the demand for wood energy increases, what we typically consider “biomass” – the crowns, limbs and understory traditionally left in the woods after harvest, will not be enough to feed the wood energy market. The concern is twofold: first, if not enough slash is left in the woods it is likely to have a negative impact on forest health. Second, competition for wood fiber may raise prices in both the wood energy and lumber and building materials markets. Most bioenergy concerns will use pulpwood as their major source of wood fiber for producing energy.²⁵

Part Two: Opportunity: Addressing Demand in Wood Energy Markets^v

The medium to long-term trend seems to be toward increased reliance on wood (including firewood, woodchips, and pellets) as a main heating source in the Northeast. All New England states saw at least a 100% jump from 2005 to 2012 in the number of households that rely on wood as the main heating source.²⁶ In addition, Vermont has included biomass energy in its Comprehensive Energy Plan to meet the state’s goal of 90% renewables by 2050, which is likely to continue to drive demand.

Firewood

This year, in-state demand for seasoned firewood exceeds supply. This is due to a combination of last year’s long cold winter, competitive prices for pulpwood at the paper mills, and fewer loggers cutting trees, which has pushed prices up and may lead to some decrease in demand in the short run. Retail sales of seasoned and unseasoned firewood become uneconomical at long distances (over about 50 miles at most), so each supplier tends to work a limited area. To the extent that firewood availability is a household security issue,^{vi} more accurate data on demand, inventory, and supply on a regional basis may be helpful in predicting and preparing for future fluctuations in weather patterns and in decisions about how much firewood to harvest from public lands; this decision is generally based on prescribed treatments in long range management plans, but building in sensitivity to market demand should be considered where it can be accomplished without undermining forest health.

There is strong out-of-state demand for kiln-dried firewood from Vermont. This demand seems to be driven, in part, by increasing real estate prices in Southern New England that make generating and storing seasoned firewood prohibitively expensive. One interviewee that is active in the Southern New England market suggests this is leading to customer dissatisfaction with seasoned wood and a willingness to pay a premium for quality kiln-dried wood. Markets for kiln-dried wood target areas with concentrations of higher income households. Kiln-dried firewood can be USDA certified by the Animal and Plant Inspection Service to ensure it is free from forest pests, allowing it to be moved in and out of areas that may have wood quarantines in response to invasive species such as Emerald ash borer and Asian longhorned beetle. The price premium for kiln-dried firewood

^v From *Draft Market Sector Analysis Summary and Recommendations*, based on secondary research and key informant interviews with industry players inside and outside Vermont. All quotes in this section are from key informant interviews conducted in the Fall of 2014 with approximately 30 businesses working in the forestry and wood products sector in Vermont.

^{vi} It is estimated that approximately 81,000 households in Vermont use firewood for heat. Frederick, Paul. “Wood chip and Pellet Supply Trends in the Market.” January 16, 2012.

may allow producers to more effectively compete with pulpmills and others for raw materials, and certainly allows for wholesale distribution in a wider geography. There appear to be opportunities for market expansion if reliable supply can be assured. However, interviewees have suggested that regulatory constraints on year-round kiln-drying combined with the cost and hurdles related to siting new facilities may limit the ability to take advantage of growing market demand.

Pellets

Vermont's only pellet mill is exploring the possibility of opening a new mill. Demand is largely coming from wholesale buyers in New England, with a relatively small amount of retail sales in Vermont. Bulk delivery of pellets by out-of-state pellet producers has been available in Vermont for some time; Vermont Wood Pellet Company is beginning to offer bulk distribution to Vermont customers. As the use of larger scale pellet boilers increases, bulk distribution of wood pellets may become an option for other fuel distributors as well. Pellet distribution for retail sales is most economic within approximately 75 miles of the plant.

Woodchips

Woodchip demand in the region is dominated by plants using woodchips to generate electricity. Vermont woodchip usage is dominated by the McNeil generating plant, which gets the bulk of its chips from upstate New York. Three additional plants using woodchips to generate electricity in New Hampshire acquire a portion of their wood supply from Vermont chips.

Woodchips are also used to provide thermal energy (heat). In Vermont there are more than 60 facilities (including more than 45 schools) that use woodchips for heat. Like pellets, woodchip distribution to smaller scale facilities is most economical in close range of woodchip producers; woodchips are usually used within a 50-mile radius of the chipping facility. Between 2001 and 2011, woodchip usage by schools and other institutions in Vermont increased 45% (and 9% between 2010 and 2011).²⁷ Half of survey respondents who reported supplying woodchips indicated that customers have asked them to produce more product than they currently had the capacity to produce, indicating that demand for woodchips is continuing to increase.

Vermont Branding

There is a difference between a Vermont “brand” and the use of Vermont forestry and wood products in Vermont manufacturing. There are some firms, like Vermont Wood Studios (furniture), Vermont Good Wood (firewood), and D’Aiello Vermont Tree Farm (Christmas trees) that target retail customers who have a positive association with Vermont. The Vermont name is not the primary factor, though. It’s product quality, performance, style. In the maple syrup market, the Vermont brand no longer commands a premium price at wholesale, but it is more likely to go to market first.

The Vermont “name” is associated with good forestry practices and/or a high standard of craftsmanship.

“Vermont brand is only occasionally a little bit important – because if it is sawn here in Vermont you know it is sustainable; that is true in the whole northeast.”

Just 9% of survey respondents, all of which produce secondary wood products, participate in the “Vermont Quality Wood Products” brand. Several respondents reported using other Vermont brands such as “Guild of Vermont Furniture Makers” and “Vermont Woodlands Association.” Less than a third of survey respondents were interested in participating in a state or regional branding initiative.

Certification

Fewer than a quarter (23%) of all survey respondents reported that their customers require forestry or chain-of-custody certification. Of these, the most common certification was American Tree Farm System (ATFS), followed by Sustainable Forest Initiative (SFI) and then Forest Stewardship Council (FSC). The highest participation rate in forestry certification programs was in wood energy, with 44% participation. The majority of respondents (55%) reported that the market didn’t justify participation in certification programs; other barriers, in order of importance, included cost to maintain certification (40%), cost to certify (39%) and lack of time (21%). Several interviewees reported having dropped previously held certifications.

Interviews made clear that certification means different things to different subsectors. FSC is a hard sell for private landowners because it is expensive and complex, compared to the Tree Farm certification, which is nearly free, except for the cost for management plan preparation and record maintenance. FSC certification does matter for pulpwood. Some mills are certified, either FSC or SFI. Even if they aren’t, many care about where the wood comes from and how it was harvested.

“Some paper mills pay premiums for FSC or want elements of FSC wood. Finch in Glens Falls pays a bonus for certified wood. SFI is also accepted by some mills.”

“There are mills in Canada that send us a blanket form that says please sign here to certify all wood you are sending us is harvested sustainably. Those might have even gone away with the demand the way it is.”

As part of the effort to raise the public awareness of the economic contributions of the forestry and wood products industry, Vermonters could be encouraged to ask where their wood came from – whether it is their firewood, furniture, pellets, or the wood that fired their restaurant pizza. This could also help strengthen the connection between Vermont woodland owners and Vermont wood-using industries by allowing some businesses to feature the suppliers of their wood materials. The agriculture and food industry has done this well, as there is a movement to know where food comes from and more restaurants talking about their local food offerings. However, wood is not food and the in-state demand for wood, even if more fully developed, would be insufficient to support a robust state-wide forestry and wood products industry. It is not clear whether the return on investment from a “local wood” campaign would be sufficient to justify its cost, in part because we do not know the extent to which Vermonters already know where the wood products they purchase on a regular basis (particularly firewood) come from. It may make more sense as part of a larger

public awareness campaign that features the large variety of forestry and wood products businesses based in Vermont, whether or not they are geared toward the local market.

Part Three: Positive Developments and Challenges in Vermont^{vii}

Selected Positive Developments

Wood Energy

The biofuels energy program through the school systems was mentioned as a positive development in three regions (not including the Central region); this program has opened up new markets for sawmill byproducts and whole chips. The growth in the use of forest fuels and wood fuels in general was cited as a positive, partly because it has opened up markets for low grade wood. Large scale biomass for energy was cited in the Southern focus group as a positive development for forest management opportunities.

Wood Product Markets

There has been more competition for loggers. Loggers and foresters reported having more lowgrade wood products markets available to them, which is improving prices for loggers. This may be as a result of more and better markets for low-grade wood products. Markets are strong and there are plenty of places to sell wood. More markets are using forestry and wood products. There has been more demand for secondary products made from local wood. This was mentioned specifically in the Central region. More and more people are seeking character wood, or wood with imperfections; the story helps to promote this kind of wood. Another example given was firewood, which is being sold for \$100 per cord on the landing, as opposed to four years ago, when a cord was being sold for \$5–6. The competition between firewood and wood chips was felt to be beneficial. The energy market, which uses low-grade wood, was also believed to be helping to support higher prices.

The popularity of hard maple and sugar maple was mentioned as a positive development in the furniture and wood products sector. When maple became the species of choice, Vermont was lucky enough to be the maple state. Everyone wants rustic now. People are enjoying holes in the wood, stains, etc. There is greater appreciation of character wood.

Participants perceive that Vermont has become the place to go for high quality wood products. It's become a destination as other areas have gone out and people want the smaller company connection. One participant mentioned that, even though he doesn't sell wholesale, wholesale companies are trying to get him to sell to them. The cachet of the Vermont brand has increased.

Safety Improvements and New Technologies

There are more equipment choices due to better and improved technology, and an increase in the use of mechanized equipment in the woods. This is also leading to more efficient and safer

^{vii} Excerpts from *Draft Focus Group Summary*, based on four focus groups held throughout Vermont to bring together a variety of perspectives throughout the forestry and wood products industry. The information in this section is based on the opinions and perceptions of the approximately 50 focus group participants.

harvesting practices. Mechanized equipment is used by 17% of companies, but it is helping to produce 60% of the wood that is harvested in Vermont. Forest management practices have also improved, partly as a result of Current Use (mentioned above). There are fewer accidents in the woods and workers' compensation rates for mechanized loggers are beginning to go down.

Selected Challenges

Cost/Price Squeeze

Global pressure on price was a challenge that was mentioned, specifically by those in secondary production, which is “mostly out of our hands,” but is an issue because of the high costs of production in Vermont. High energy costs relative to Canada was also mentioned as a challenge.

Cost of Equipment and Lack of Infrastructure

The shorter winter harvest season is a concern. This is tied to the number of loggers operating and the equipment that they own and whether that equipment is adapted to more marginal times of the year. Fewer people are entering logging and that is partly because of the cost of the equipment for them to enter the market. Cut to length is one example; those in this market are excited about this opportunity, but the cost of equipment to enter this market isn't reasonable for a younger person to be able to step into.

Infrastructure is an issue, such as the cost and availability of three phase power and “clean” electricity of consistent quality (e.g. no brown outs).

Taxes related to health care were mentioned as a barrier to hiring. Quick changes in different directions (whether single payer, taxes, minimum wage, etc.) around policy creates business uncertainty that is a significant challenge.^{viii}

Regulatory Uncertainty

Uncertainty in the regulatory and property tax environment is another big challenge. Property taxes drive decisions about managing land. An ever-increasing tax burden forces people to make decisions about their land; often forcing them to sell it. This is not productive for future forests. From a regulatory standpoint, Use Value Appraisal has created a different landscape than existed when it started. Generally speaking, this has been positive for the industry. However, the tendency of the legislature to revisit the terms of Current Use on an almost annual basis creates a great deal of uncertainty and is beginning to undermine the value of the program since people do not have confidence that it will continue as it has in the past. There is a perception that it is undesirable to eliminate Current Use, but people in the industry are interested in having it be more stable.

There is also a perception that there is a propensity to have more regulation in Vermont relative to nearby states, which is not good for the forestry industry. This creates additional cost and less production and puts more economic pressure on the industry in a negative way. Most of these

^{viii} The final focus group was held just before Governor Shumlin announced his decision to scrap single payer health care for Vermont. Participants were very concerned about the rumored increase in taxes that would have accompanied single payer.

comments were in relationship to Act 250. Participants perceive that there is much more regulation in establishing a manufacturing site in Vermont compared to adjoining states. For example, if you wanted to start a sawmill in a place that was not already a sawmill, there would be an uncertain process. The state does not have a fast track process for companies that will produce jobs in the state, related to the forestry industry. Local zoning and NIMBY (Not In My Back Yard) is a problem when something on a large scale is proposed for a small community.

Transportation

Trucking and transportation were mentioned as a challenge unless you have your own vehicles and your own drivers. The ups and downs in demand make trucking logs a challenging business. There is a perception that loggers are buying trucks but looking at it as a break-even endeavor. It gives them the opportunity to move material and allows for convenience. Trucking and transportation challenges were also mentioned by those producing and selling secondary products.

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- ¹ “The State and Future of U.S. Forestry and the Forest Industry: Workshop Report and Recommendations.” Washington, DC. May 29-30, 2013. http://www.usendowment.org/images/Forest_Sector_Report_-_FINAL_9.5.13.pdf Accessed 07/15/14.
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