Assessing Eastern White Pine Lumber Production and Use in the Eastern United States

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Abstract

A survey of primary and secondary manufacturers of eastern white pine (EWP) was executed within three regions of the Eastern US: New England, Mid-Atlantic, and Lake States. Two hundred ninety-six usable questionnaires were returned in total, with 185 coming from primary manufacturers and 111 from secondary manufacturers of EWP. The data from these surveys was used to identify differences in market characteristics between the three regions producing EWP, and also between primary and secondary industries.

It was found that markets for EWP were growing in all three regions. Overall growth among primary manufacturers was estimated at 6.9% during the next 5 years, with 18.9% expected from the secondary industry. Industry members in all three regions reported that they would be able to sell more EWP products if they could get more logs. This theme of log shortage and availability was present in all three regions, and likely has to do with the loggers in those regions and how much importance they place on harvesting EWP.

Results indicated that primary manufacturers overestimated how highly secondary manufacturers valued machinability, product range, and the rustic look of EWP, as significant differences were found in all of those categories. This implies that sawmills need not emphasize these aspects as much as they have been, as they are less important to customers than sawmills may have believed. Conversely, primary manufacturers

underestimated how highly secondary manufacturers valued on-time delivery, consistent price, JIT delivery, and flexible payment options. These results suggest that EWP sawmills would be able to gain an advantage by putting more effort into providing these services.

The effect of imported species appeared to be less than anticipated, with more than one-half of both primary and secondary respondents reporting that imports had had no impact on their operation. However, primary manufacturers were more likely to report a negative effect than their secondary counterparts, with negative response rates at 41% and 20%, respectively.

Dedication

For those of you who know her, it will come as no surprise that Wibke has been what's kept me going during the past 4 years. I hope she keeps me going for many more.

This one's for her.

I also want to express my gratitude to Paul K. Duvall, Anne F. Duvall, and Linda D. Andahazy, who have all given me far more than I could ever return.

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Preface

This thesis consists of six chapters. Chapter One describes the problem and the objective of this research. It also provides background information on eastern white pine, and it explains the methodology used to perform both the survey and the interviews. Chapter Two summarizes and discusses findings of the study regarding regional differences between primary manufacturers of eastern white pine, while Chapter Three provides the same analysis for the secondary manufacturers. Chapter Four analyzes differences between the primary and secondary eastern white pine producing industries. Chapter Five describes the results of the personal interviews among industry representatives, and Chapter Six provides a research summary, including suggestions for future research and limitations of the study.

Some duplication of information exists within the chapters. This was necessary to allow chapters to stand alone as separate publications. The author apologizes for any inconvenience this may cause the reader.

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Chapter 1: Introduction, Background, Methodology

Problem Statement and Justification

John F. Kennedy once said, "Change is the law of life. And those who look only to the past or present are certain to miss the future." Any marketing manager would be quick to state that one need look no further than the market forces driving an economy to prove the worth of this statement. Issues such as tastes and preferences, quality and availability of raw material, manufacturing capability, price, and many more variables all interact on a continual basis to derive demand for all categories of products.

Additionally, these market variables are themselves consistently morphing and evolving, which creates a dynamic business environment in which adaptors are favored and laggards are punished. Wood products are no exception to this phenomenon, with their markets changing drastically as demand components fluctuate. Given such a steady state of change, success is generally earned by those who stay abreast of market conditions. Producers of eastern white pine (*Pinus strobus*), a tree species common to the eastern United States, are currently facing many such changes as they struggle to maintain eastern white pine's place as a mainstay in the wood products industry. Much information is still needed about the characteristics of this specie's markets before more successful white pine marketing strategies can be developed and implemented.

During the past 100 years the New England states have traditionally produced the most eastern white pine of any region, although the Mid-Atlantic and Lake State regions also have significantly large growing stocks of white pine. There has been little concern about this disparity being out of proportion as it would seem only natural that the region with the most raw material should develop and maintain the strongest industry for that

species. Yet, it has recently been suggested that the difference in eastern white pine utilization between the three regions is more than simply a supply issue. Based on USDA Forest Service inventory analysis, sawlog inventories have risen dramatically in the Mid-Atlantic and Lake State regions from the late 1970's to the early 1990's, creating a sizable disparity between sawtimber volumes and sawtimber utilization in those regions (Irland, 1999 "Eastern White Pine"; Wiedenbeck, 2003). In other words, white pine growing stocks are increasingly larger than harvests. This growing disparity brings regional issues into question such as quality differences, supply accessibility, production limitations, resource ownership, or one of many other factors that may affect a region's ability to market a similar material.

Aside from production figures, there is also the issue of high-value versus low-value products being produced from eastern white pine roundwood. A general trend has been noted in the Mid-Atlantic and Lake States towards using white pine timber to produce more low-value products such as pulp stock, pallet cants, and OSB chips, whereas the New England area tends to produce considerably more high-value lumber (Wiedenbeck, 2003). This has serious implications for landowners interested in both managing and selling timber in these regions. Further, finding higher-value markets for timber would not only serve individual landowners but also boost local economies by increasing the value of all white pine forestlands and allowing more profit to be made at each level of the distribution chain.

Another topic at the forefront of this issue is the fact that sawmills in the Mid-Atlantic and Lake State regions are indeed sawing a significant amount of white pine, but they are buying the logs from the New England area (Wiedenbeck, 2003). Considering

the ample local white pine supplies in these regions, one would immediately postulate that some type of quality difference exists between the regions. However, quality differences may be perceived and not based on actual differences. Alternatively, white pine may be difficult to access in certain areas, or local supplies may not be consistent enough to depend on for continuous production. Whatever the reason, it is certain that many parties stand to benefit from the improved raw material utilization that would result from an increased understanding of these markets.

Finally, there is the issue of imported species and the pressure that they are placing on markets for domestic species. Radiata pine's rapid influx into the US marketplace has been well documented during the past 10 years, and its extremely competitive price has threatened all other species whose markets it has entered as well as the white pine market. Most of radiata pine's applications, such as moulding, millwork, and other milled dimension parts, are shared with eastern white pine, making the two species direct competitors (Horgen and Maplesden, 1997; Harding et. al. 1999). Compounding the situation, New Zealand and Chile currently report large growing volumes of radiata pine in their countries, which means that supplies to the US are likely to increase or at a minimum hold steady for the next 10 years (Jélves et. al. 1989; Horgen and Maplesden, 1997). None of this implies that white pine is facing unavoidable decline, but it is clear that action must be taken to investigate market opportunities for eastern white pine if eastern forests are to realize their full economic potential.

Research and Objectives

The goal of this research was to obtain a more complete understanding of the markets for eastern white pine in each of three US regions: Lake States, Mid-Atlantic

States, and New England States. This information will be used to compare the three regions and to look for opportunities to transfer successful technologies or techniques between regions. Additional objectives include obtaining production volumes, identifying competitive advantages and disadvantages (including the effects of species imports), and assessing growth potential for the white pine industry. This information will provide a current analysis of the white pine industry that may aid further development of white pine markets. Lastly, the study will include insights shared by both primary and secondary white pine manufacturers that will improve our understanding of the needs and demands of both segments. This information will be critical in determining inconsistencies between the characteristics of lumber that sawmills produce and the lumber characteristics that secondary manufacturers prefer. If inconsistencies exist, then steps can be taken to remove these market barriers, which would hopefully facilitate the utilization and manufacture of eastern white pine across all regions.

Specific Objectives:

1. Identify differences in eastern white pine market characteristics between New England, Mid-Atlantic, and Lake State regions of the US, as they pertain to both primary and secondary industries.
2. Identify differences between primary and secondary manufacturers in terms of desired product attributes that may impede the efficient marketing of eastern white pine lumber.

Literature Review

Background

White Pine's History, Historical Uses, and Current Uses

Eastern white pine (*Pinus strobus*) is a coniferous tree species traditionally found in the mountainous eastern states and in the northern Lake State regions of the US. It has a long history in these areas, where the early colonial settlers quickly recognized it as a high-value commercial species. Eastern white pine was one of the species processed into lumber at the country's first sawmill in 1623 at York, Maine. It was also one of the most commonly used building materials up until the late 1880's, supplying at least half of the country's softwood lumber needs. Its lightweight and limber tree stems were soon adopted for use as masts by the Royal British Navy, which coveted the material so highly that it implemented a "Broad Arrow policy" by which all white pine trees of exceptional quality were reserved for the English King (Howard, 1986).

This phenomenal demand for white pine decreased after 1900 as eastern forests were depleted of the species and loggers shifted toward more plentiful timber species (Howard, 1986). Its usage as a construction material also declined, as it proved inferior to many other softwoods in structural properties. Today, white pine is rarely used as a raw material for construction lumber, as it is significantly weaker in strength than other softwood species (Fisette and Rice, 1988) (Table 1). However, its softness and light weight coupled with its exceptional dimensional stability (volumetric shrinkage = 8.2%) and durability make it ideal for other applications such as millwork, paneling, siding, boards for crates, boxes, coffins, boats, and crafts (Wengert, 2000; NeLMA, 2003).

White pine holds paint and stain very well and is easy to machine. Additionally, lower quality white pine timber is a growing source for chips used to produce engineered wood panels and various other products (Clatterbuck and Ganus, 2000).

Table 1. A listing of structural properties for softwood species commonly used in construction (Note: Loblolly, Shortleaf, Longleaf, and Slash Pine are all considered "Southern Yellow Pine").

Species (MC 12%)	Specific Gravity	MoR (kPa)	MoE (MPa)
Eastern White Pine	0.35	59,000	8,500
Spruce, Engelmann	0.35	64,000	8,900
Spruce, Sitka	0.36	65,000	9,900
Loblolly Pine	0.51	88,000	12,300
Shortleaf Pine	0.51	90,000	12,100
Longleaf Pine	0.59	100,000	13,700
Slash Pine	0.57	112,000	13,700

Source: Forest Products Laboratory, 1999.

Common Growing Conditions and Locations for White Pine

Although eastern white pine will grow well in high quality soils, it does not compete for survival very well with other faster-growing species and therefore is usually not a major component of stands growing on high quality soil. Alternatively, white pine does have a high tolerance for poor soil, and will grow where many other species will not. For this reason, white pine performs best on coarse, sandy soils of slightly lower quality where other species have difficulty competing (Clatterbuck and Ganus, 2000). New England's mountainous terrain provides these favorable soil characteristics, and so it is not surprising that the plurality of eastern white pine grows in this region.

It is interesting to note that white pine in the southeastern regions tends to grow faster than in northern regions (Irland, 1999 "Eastern White Pine"). This is most likely attributable to the milder climate and higher quality soil conditions, and rainfall may be a

contributing factor as well. Eastern white pine has also been known to perform well in old fields where low crop productivity has led to abandonment by resident farmers (Irland, 1999 "Eastern White Pine"). This may be of particular interest in the southeast where eastern white pine's fast growth in sub-par soil would make it a favorable species on such land. Such a tree-crop plantation would also have ecological benefits such as reducing soil erosion, improving water quality, reducing pesticide applications, and generating extra income for the landowner (Clatterbuck and Ganus, 2000).

Diseases

Among the many factors that may influence white pine's marketability within each region is the presence and severity of disease among the tree population. There are a number of diseases that specifically attack eastern white pine, and there is evidence to show that these diseases do not occur at equal frequencies in each region. Therefore it is possible that a relationship exists between the occurrence of these diseases and the strength of the eastern white pine markets in each region. The two major diseases that affect eastern white pine are: 1) white pine weevil, and 2) blister rust (Marty, 1986; Katovitch and Mielke, 1993).

White Pine Weevil, Blister Rust

White pine weevils (*Pissodes strobi*) are ant-sized insects that lay their eggs in the terminal shoots of white pine branches in early spring. Around mid-summer the eggs develop into their larval ("grub") stage where they feed on the interior cambium layer of the new shoot. The cambium provides them with all the nutrients they need to reach adulthood in mid to late summer, when they emerge from the infested site to find shelter

in the needle layer on the forest floor. Weevil attacks are easily detected by the damage they cause to new branch growth, which results in a characteristic "Shepard's Crook" formation at the terminal shoot. The damage inflicted on the new shoot is severe and kills everything above that point in the stem, which causes the growing tree stem to continue growth through a lateral branch (Katovitch and Mielke, 1993). This growth pattern seriously decreases the value of a tree stem.

The second most prevalent disease threatening white pine is blister rust (Cronartium ribicola), which is a rash-like canker that can be located on any twig, branch, or even the main stem of a tree. The infected area often shows an obvious color contrast to the normal healthy greenish color of young white pine branches, and orange-yellow spores can be seen on advanced infections. Needles on infected branches will begin to turn brown while remaining on the branch, producing a discolored "flag" effect that aids detection (Katovitch and Mielke, 1993).

Infection Rates between Regions

As previously mentioned, infection rates vary between regions. Weevil attacks are common in the northern states, but are almost unheard of in southern regions. Blister rust tends to thrive in cool, damp environments, which is also more commonly found in northern regions (Katovitch and Mielke, 1993; Marty, 1986). Thus, it appears that white pine's most common diseases are mainly found in the northern areas. This is quite logical, considering that these areas traditionally contain the largest growing stock of eastern white pine in the country and are therefore a natural habitat for such infectious organisms. Additionally, it must be noted that having such protection from disease in

southern regions should theoretically provide extra incentive to grow white pine in these regions as opposed to the traditional northern regions.

Forest Ownership

Private vs. Public

Land in the Eastern US is notorious for its propensity to be divided up into plots of irregular shape and size owned by private individuals. Forests are no exception to this tendency. During the years, the eastern US population has maintained its preference for private land ownership as opposed to government run territories such as national forests or national parks. This preference has resulted in an intertwined patchwork of land ownership consisting of protected government lands, government forestland, farmland, corporately held private land, and individually held private land. Each ownership type manages its land to serve their unique interests, resulting in varying management styles with little regulation of land utilization.

Small variations in land ownership exist between the three regions included in this study, but private land ownership remains the most common ownership type throughout the eastern US. To illustrate this, Figure 1 breaks down forestland ownership in the eastern US. "Forest Industry", "Farm", and "Non-farm" sections are all considered private, while all others are considered public ownership. As indicated in the graph, a vast majority of forestland is in the hands of private, non-industrial and non-farm individuals (classified as "Non-farm", 62%). These landowners usually own relatively small tracts of land, meaning that the majority of timberland is owned by many small and independent individuals.

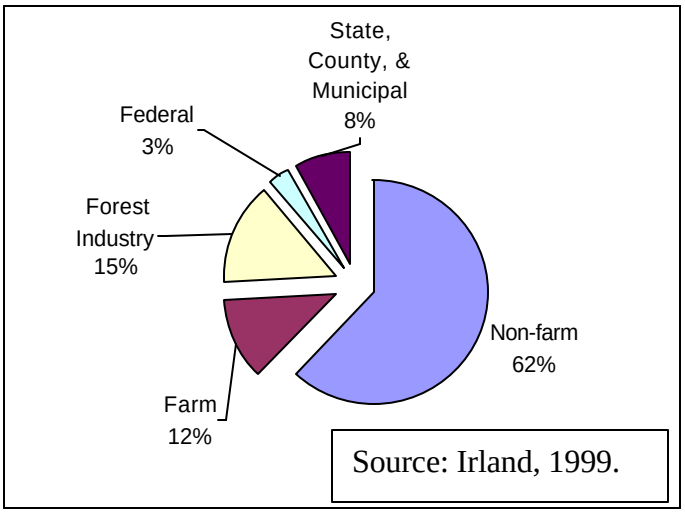


Figure 1. Commercial forestland ownership in the eastern US

Such high percentages of ownership by smaller individuals is useful in determining market variations between regions, but it is also interesting to see whether or not this holds true for eastern white pine, which is the main concern of this study. US Forest Service data confirms that white pine forest ownership mirrors this pattern except for in the Lake States region.

Figure 2 compares eastern white pine forest ownership percentages among the three regions. This data does not indicate specific types of private ownership, grouping industrial, farm, and non-farm all into "private". As Figure 2 shows, Mid-Atlantic and New England States exhibit similar ownership structures, with about 90% of white pine forestland privately owned, and about 10% owned by various public authorities. The real difference is found in the Lake States, where about 40% is publicly owned. This ownership structure may have an influence on the ability of sawmills to access raw materials, potentially improving or impeding material flow. Mills in this area may benefit from economies of scale resulting from dealing with large forest tracts (e.g., state

forests), thus improving their ability to process white pine timber. In other cases, it is likely that government restrictions create barriers to harvesting in general, thus reducing raw material flow.

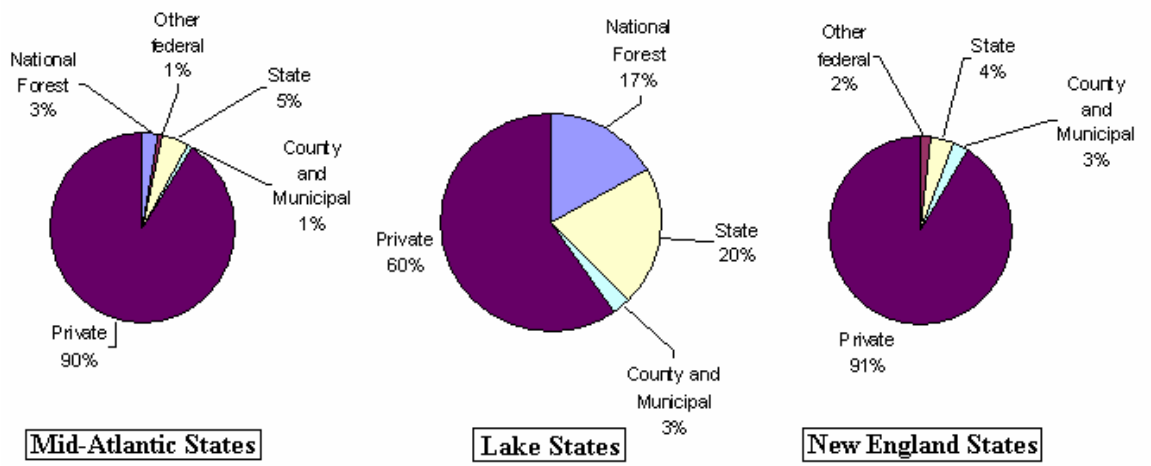


Figure 2. White pine forestland ownership, by region.
Source: US Forest Service Inventory Analysis, 2003.

Owners' Use of Forestland

Having established the ownership characteristics of the eastern US forests, the question of land use objectives (landowner motivation for ownership) remains. Figure 3 presents nine possible motivations for owning forestland, and then ranks them first by number of landowners claiming a particular motivation, and secondly by acres dedicated to a particular motivation. As the graph illustrates, the plurality of forestland owners use their property as a residence, which implies that their houses are most likely surrounded by a modest timber stand of 5 – 100 acres, rather than vast timber holdings more typical of corporations or government properties. Also of note is the fact that "timber production" is the least frequently cited motivation for owning land, but it represents the single largest category for land use in terms of acreage. While many smaller individuals

do indeed own land mainly for timber harvesting purposes, this large disparity between landowner response and actual acres dedicated to a specific purpose is attributable to the few companies that own large quantities of forestland in timber production.

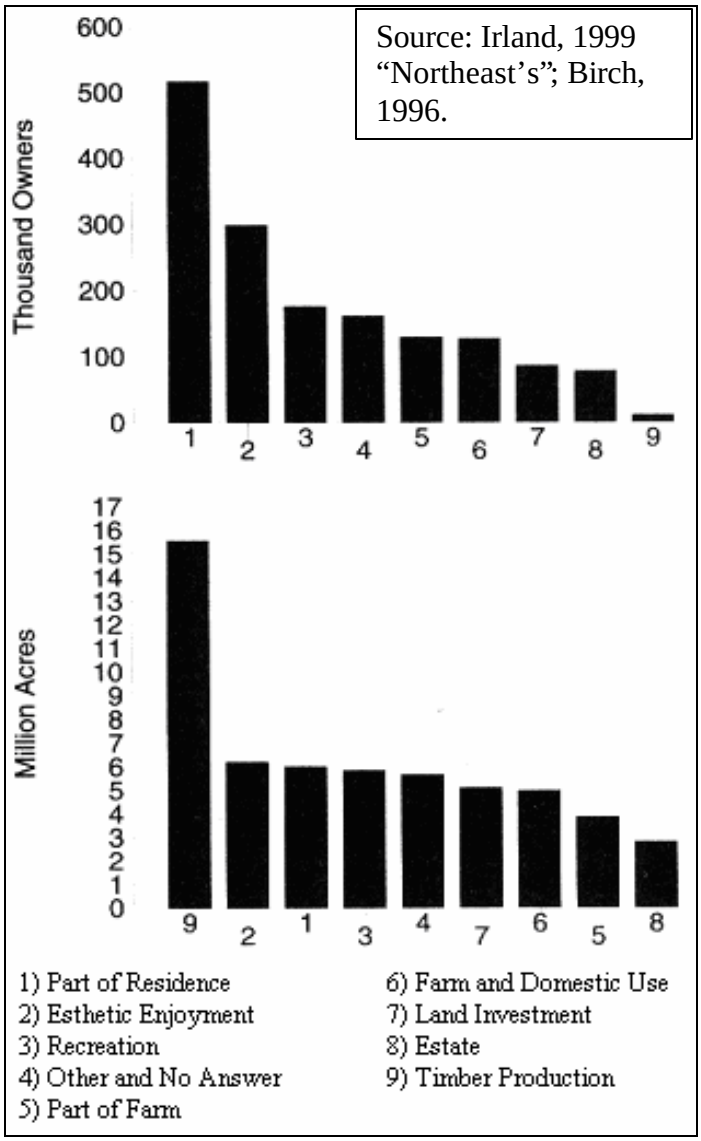


Figure 3. Estimated number of ownership units and acres of northeastern forestland, by primary reason for owning forestland.

Based on the information in Figure 3, one can conclude that the eastern US exhibits a high level of fragmentation in forestland ownership, which may present unique

difficulties to the white pine industries within the Mid-Atlantic, Lake States, and New England regions. This decentralized ownership structure may cause buyers difficulties in procuring raw materials due to the large amount of individual interactions with landowners that must take place to obtain sufficient sawtimber stocks. This process would be much easier if larger timber quantities could be purchased at one time, thus reducing transaction costs. Additionally, the ownership structure within some regions may prove to be more favorable to white pine procurement and/or harvesting than in others. If this is the case, then these differences must be identified and recognized as regional barriers to the marketing and utilization of white pine timber.

Eastern White Pine as an Industrial Raw Material

NeLMA and Eastern White Pine Grades1

The Northeastern Lumber Manufacturers Association (NeLMA) is the grading agency for eastern white pine lumber. NeLMA employs approximately seven inspectors, three administrative employees, and an executive officer (president), and has its headquarters in Cumberland, Maine. As described in the 2003 NeLMA Membership Directory, a sawmill that wishes to utilize the NeLMA grade rules and affix the official NeLMA mark to their eastern white pine lumber must "have well-established credentials in the manufacturing, seasoning, and grading of Northeastern lumber. Once a member mill demonstrates its efficiency in grading and its conformity to all of the established rules and regulations, it is licensed to grade-mark its products with the official NeLMA

[1] All information presented in this section is sourced from various NeLMA publications, as listed in the Literature Cited section. Grade photos are from the NeLMA website.

mark." Periodic visits are also made to member mills to inspect for adherence to these grade rules.

NeLMA's main constituency is in the northern and northeastern regions of the US where white pine is a prevalent tree species, with its strongest membership in the New England states, New York, and Pennsylvania. Mills tend to use NeLMA rules less as one travels south, beginning around Virginia. The most likely reason for this is that users of white pine lumber in the south have not been acquainted well enough with NeLMA's grade rule system, and therefore have no demand for NeLMA certified lumber. Additionally, NeLMA certification representatives do not currently service most parts of the Mid-Atlantic region for lack of market penetration (Easterling, 2003).

There are seven basic grades that are used to market white pine lumber. These grades are visual in nature, and their main purpose is to specify which boards have the aesthetic qualities required to be used in various white pine markets. Strength is not accounted for in these grades, and therefore a higher-grade does not guarantee a higher structural integrity. The higher board grades do generally feature better structural properties though, because visual and structural defects are often the same (although, minimum serviceability standards exist for all grades). From highest to lowest, the white pine grades are 1) D & Better Select, 2) Finish, 3) Premium, 4) Standard, 5) Industrial, 6) NeLMA 2A and Better Furniture, 7) No. 2 Cuts or Better. Photographic samples of these grades are provided in Figure 4 through Figure 10.

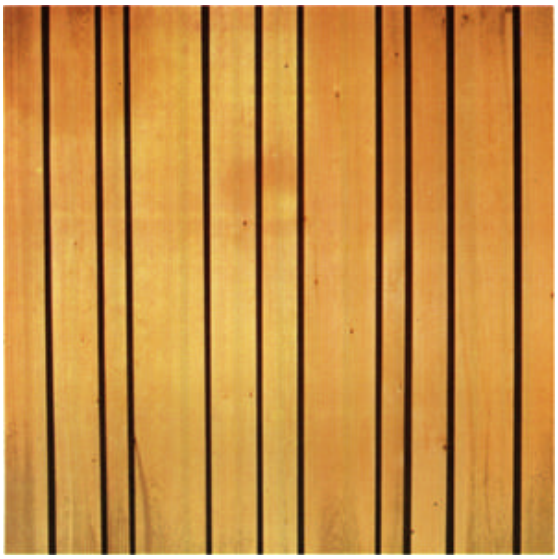


Figure 4. D & Better Select grade.

Figure 5. Finish grade.

NeLMA makes a distinction between two general categories of lumber grades for eastern white pine; these categories are: 1) selects and 2) commons. The selects category is made up of C selects, which is the highest possible grade, and D selects, which is still very high quality and similar in nature to the C selects. These two grades are usually sold together as "D & Better Selects". The D & Better Select grade may contain some boards with small defects as long as they are well spaced and have plenty of clear material. It is

most commonly used for natural or stain finished products, fine woodworking, and interior trim moldings.

The commons category basically covers all other white pine grades. The highest of these is Finish, which is depicted in Figure 5. This grade permits more knots of slightly larger size than higher-grades, but most knots should be sound and tight, and few additional defects are allowed. This grade can be used for the same applications as higher-grades when a more rustic or natural finish is desired, and it may also be used for painting applications. The next highest commons grade is Premium, which is a knotty grade used for the same basic applications as Finish but with a slightly rougher appearance. Premium is also highly recommended for painting applications, as all defects except knots are held at a minimum. The D & Better Selects, Finish, and Premium grades are graded by the best face, while the reverse face must be of Standard grade or higher.

Figure 6. Premium grade.

Figure 7. Standard grade.

Standard grade white pine is primarily a utility grade, and allows more of all defect types into its boards. Its main uses are in light construction and industrial areas, but the upper end of the grade can also be used for decorative purposes where a highly rustic appearance is desired. For this reason, the Standard grade is divided into two categories: 1) appearance, and 2) construction. The entire range of Standard board grades, including both appearance and construction, is displayed in Figure 7. The lowest common white pine board grade is Industrial, presented in Figure 8. This grade allows large amounts of most defect types as long as the full length of the board remains serviceable, and it is mostly used in industrial and construction applications where strength and appearance characteristics are less important.

Figure 8. Industrial grade.

Figure 9. NeLMA 2A & better Furniture grade.

After selects and commons, there are two additional grades that are intended for specific industries or end products. Boards in these grades have many defects but also possess redeeming qualities that make them useful for certain purposes. These two extra grades strive to make better use of the raw material by identifying these redeeming attributes within otherwise low-grade lumber and marketing it to the appropriate industries. The NeLMA 2A & Better Furniture grade, presented in Figure 9, is intended

for furniture producers who can use boards with well distributed, sound and tight red knots that will yield a certain percentage of sound cuttings.

Figure 10. No. 2 Cuts or better.

Likewise, the No. 2 Cuts or Better grade, presented in Figure 10, includes pieces that will yield at least 40% clear cuttings of at least 3" wide and 1 ft² in area. This board grade can be used by industries such as dimension parts manufacturers, where smaller cuttings are made from boards and long length cuttings are not always required.

Production Characteristics of White Pine Sawmills

Although eastern white pine is taxonomically softwood, it is processed and marketed as a hardwood. White pine lumber is processed in hardwood sawmills alongside other hardwood species, using the same equipment and techniques (Easterling 2003). This implies that white pine logs are most commonly sawn "for grade", which means that mills sawing white pine are concerned with capturing the maximum grade value from each individual log. Achieving this desired result usually involves a process that could evaluate a log to find an optimum cutting bill that would yield the largest

quantity of high-grade material. The log would then be manipulated prior and during sawing in accordance with this individual cutting bill. An example of this would be a *carriage headrig* system, which passes a log through a saw multiple times, producing a new board with each additional pass (Haygreen & Bowyer, 1996).

This differs from typical softwood "straight sawing" operations that take much less effort (or no effort) to rotate logs for maximum value during sawing. An example would be the *straight pass headrig*, where a log passes only once though a gang saw or a series of saws, resulting in boards of varying thicknesses that are further processed by secondary saws (Haygreen & Bowyer, 1996). Anecdotal evidence suggests that the reason for this variation in hardwood and softwood production techniques is the large price difference between hardwood appearance grades and the relatively small price difference between softwood structural grades. In other words, softwood mills can make more money by sawing boards quickly and indiscriminately, while hardwood mills can make more money by taking time to saw as many high-grade boards as possible out of each individual log.

Having established that white pine lumber is essentially produced by the same methods used to produce hardwood lumber, it is useful to describe some typical characteristics of white pine mills and mention a few qualities that may contribute to a mill's success or failure. In New England, the median size mill producing primarily white pine lumber saws around 13 million board feet (MMbf) annually, with smaller mills producing from 3 to 5 MMbf, and larger mills producing anywhere from 25 to 62 MMbf annually (NeLMA, 2003). This is rather large compared to the overall national hardwood industry average of 7.6 MMbf annually (Bowe et. al., 2001). Other New

England mills produced a minority of white pine along with various other species, and these mills typically produced less than 4 MMbf of white pine annually (NeLMA, 2003). There are typically no differences in production set-up or equipment between mills sawing 100% white pine and those sawing white pine as smaller percentages of total production (Easterling 2003). White pine lumber production estimates for other regions were not available, but it is estimated that they are likely to be lower than in New England.

There are a few differences between large and small volume white pine sawmills. Large mills tend to treat their lumber more as a commodity and they are usually more production oriented (although certainly not to the extent of plywood or SYP/SPF lumber producers). This gives them some advantages in that they can usually produce the most consistent product at the cheapest cost, while a large customer base and a more flexible cash flow give them more cushioning in times of economic slowdown. Large mills also have the ability to handle high-volume orders, which is a clear advantage over smaller mills. Alternatively, being so production driven also makes them less reactive to small scale fluctuations in market demand and less able to tailor products to individual customers or market niches. Smaller producers, on the other hand, have greater production flexibility and are therefore better able to satisfy demand from such small market niches. This ability has enabled smaller white pine producers to carve out extra earnings and stay competitive through times of economic difficulty (Easterling, 2003).

Despite inherent differences between large and small white pine mills, there are certain product attributes that are highly valued and can be achieved by large and small mills alike. Perhaps the most important of these distinguishing characteristics is a

reputation for accurate grading. If a sawmill is able to establish a reputation for producing consistently and accurately graded lumber, then customers begin to trust that they will get what they pay for when dealing with that sawmill. Achieving such a reputation can be facilitated by a variety of factors, the most important of which is a ubiquitous company-wide attitude that values accurate lumber grading. Sawmills that place a high importance on quality control and the training of lumber graders will simply have a greater ability to accurately grade boards. Additionally, mills must encourage graders to grade strictly by the rules, despite the fact that sawmills can increase profits in the short term by including fractional amounts of lower-grade material into higher-grade lumber packs. While other factors may also play a role, achieving consistent and accurate lumber grading relies ultimately upon the values held by the management and the abilities of individual lumber graders (Easterling, 2003).

Utilizing current and applicable technology may also make mills more successful. Technological advantages usually result in an ability to get more value out of each log, whether it is by reducing production time, automating a process, augmenting yield, or reducing inventory. These improvements can increase a mill's ability to make better lumber out of the same log, thus directly increasing profits. Although, new technology is often very expensive, and benefits must always be weighed against cost before any net benefit can be claimed.

However, it is thought that resource availability does not heavily factor into a sawmill's success or failure. White pine logs are most often bought on the open market, and therefore the same resource is basically available to everyone (Easterling 2003). This

is particularly true for New England, and it is not known how much this may vary between other regions.

Marketability of Eastern White Pine Lumber, Products

Eastern white pine is favored by many industries for its favorable attributes. The moulding, millwork, window, door, and component industries value white pine's machinabiliy, as it takes well to sanding and routing processes. Anecdotal evidence suggests that eastern white pine also offers plenty of long, clear cuttings that are in high demand from moulding operations. The material's light weight and high relative strength (compared to weight) is also an advantage in these applications, as long pieces can become cumbersome to transport. Additionally, "knotty pine" products produced from white pine lumber has been popular in certain markets for its rustic and natural appearance. While this trend has had less momentum in recent years than it has previously experienced, the popularity of this style is showing signs of a rebound according to industry representatives involved in EWP markets (Easterling, 2003).

Price

Price is another advantage that white pine has over many competing species. Figure 11 illustrates price trends for three softwood species of comparable grades that are commonly used in moulding and millwork markets across the US. As the graph indicates, white pine prices have been very competitive during the past two years, and prices have remained very stable. However, other species have narrowed the price gap in the past six months, which decreases any price advantage that white pine producers may have been experiencing.

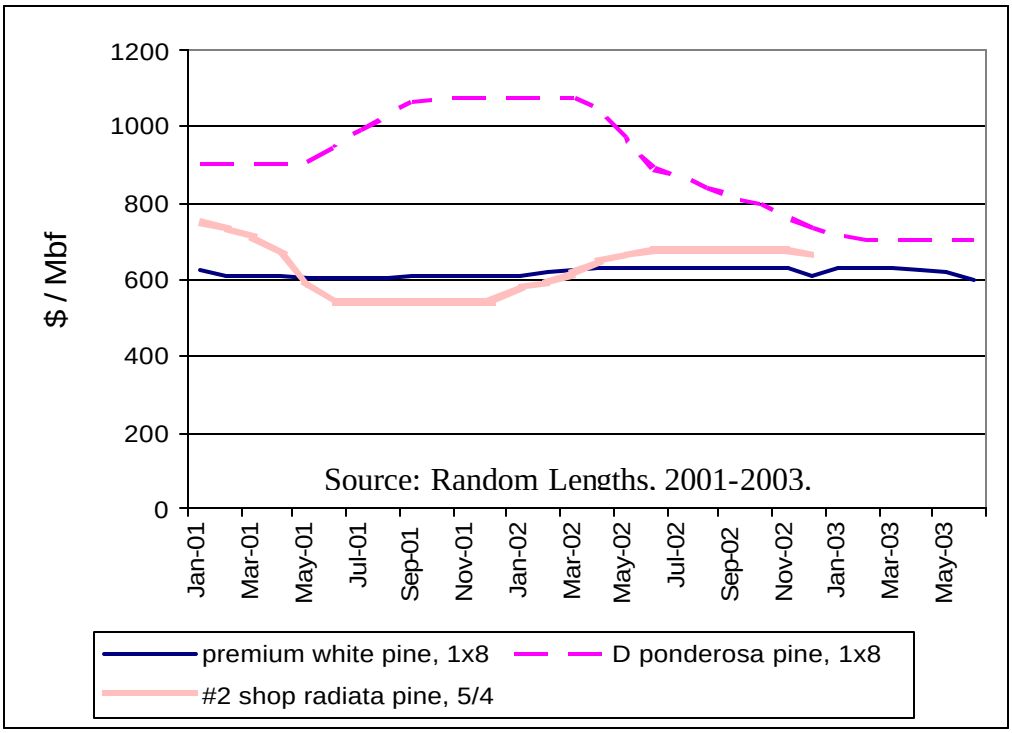


Figure 11: Price trend comparison of three softwood species that compete in similar markets.

Figure 12, Figure 13, and Figure 14 all present similar data for a few hardwood species of comparable grade that are commonly used in moulding and millwork industries. As the figures indicated, kiln dried red oak and cherry lumber are considerably more expensive than white pine; with white oak prices only slightly higher than white pine on average. It must be noted that the species represented in these pricing charts do not comprise the whole market. Other hardwood species compete with white pine more closely on price, with many of the less popular species being priced at well below average white pine prices. Some of these species are yellow poplar, ash, basswood, hickory, elm, beech, and birch.

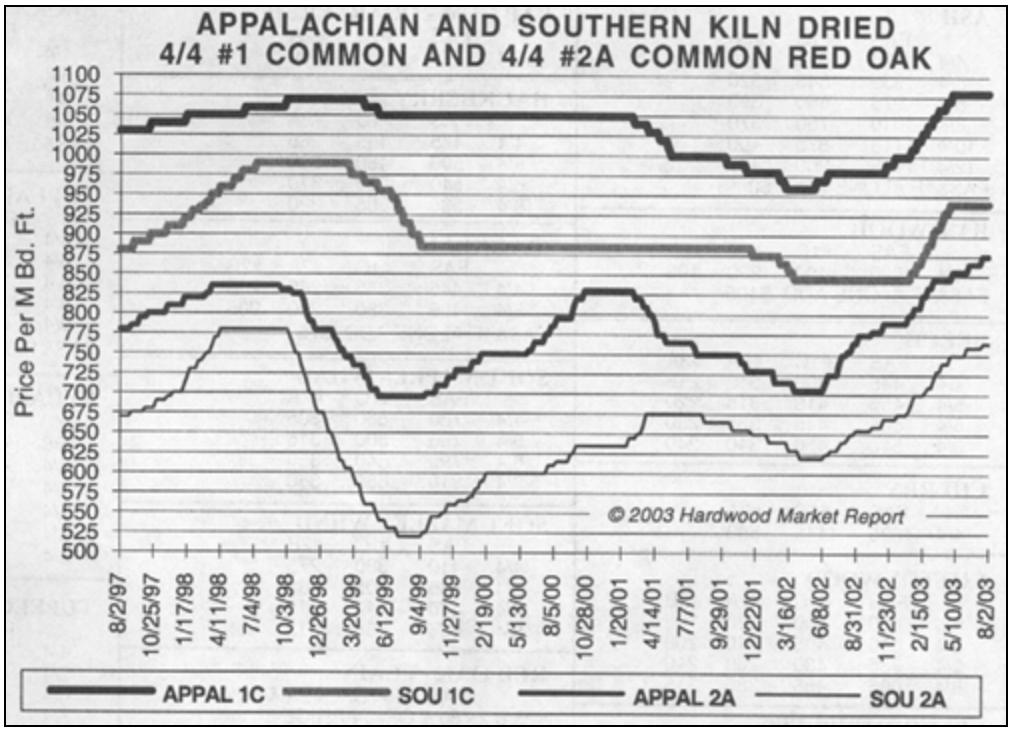


Figure 12. Red oak pricing trends. Source: Hardwood Market Report, 81(31):1. Reprinted by special permission, Hardwood Market Report, 2004.

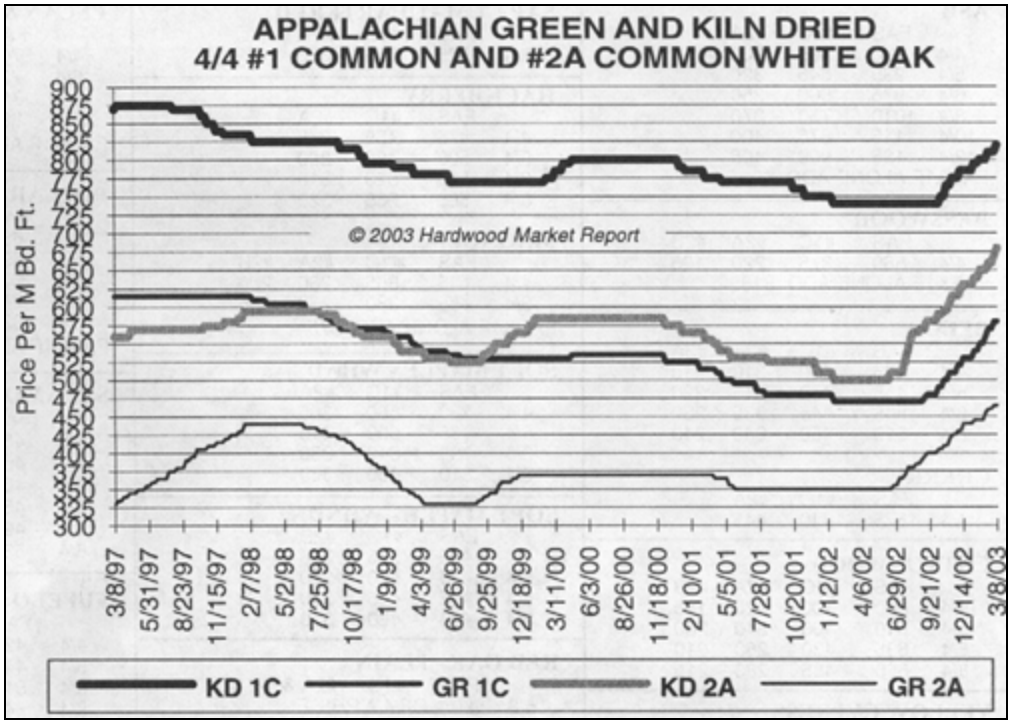


Figure 13. White oak pricing trends. Source: Hardwood Market Report, 81(10):1. Reprinted by special permission, Hardwood Market Report, 2004.

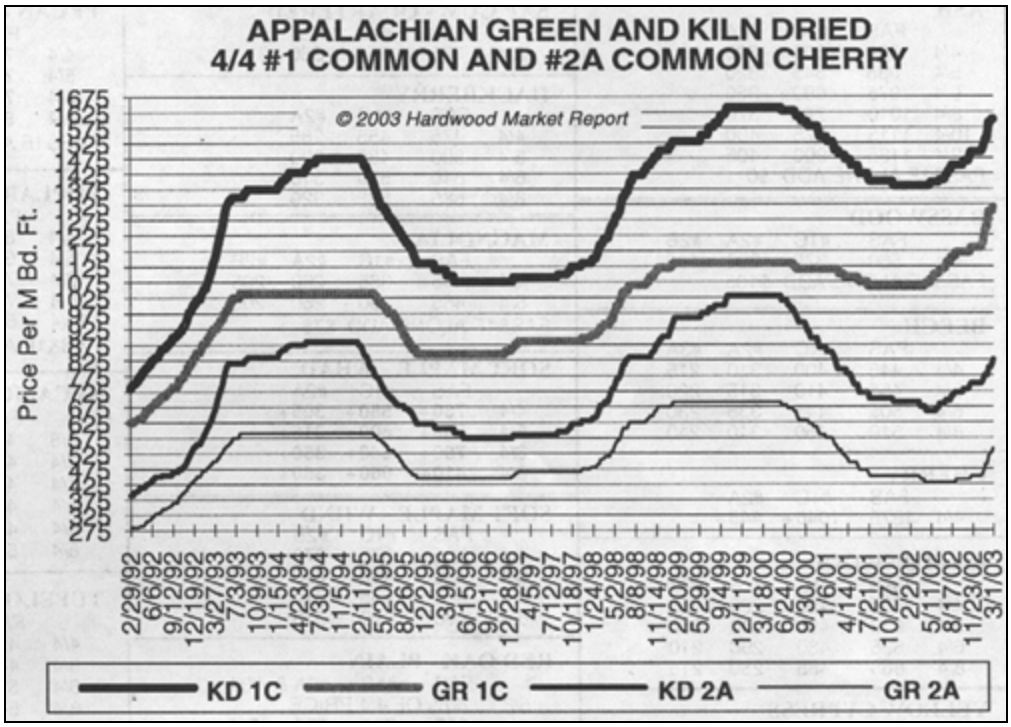


Figure 14. Cherry pricing trends. Source: Hardwood Market Report, 81(9):1. Reprinted by special permission, Hardwood Market Report, 2004.

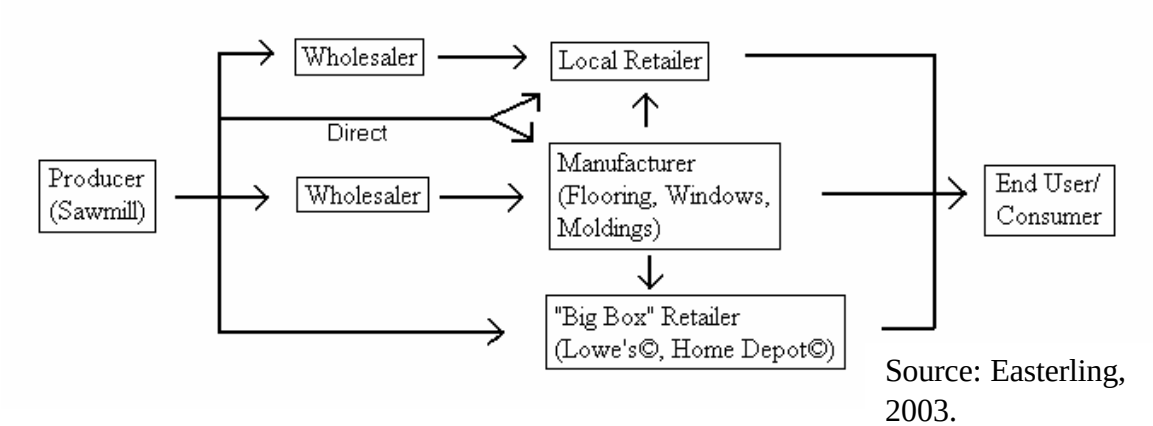
Promotion

The industry trade association, NeLMA, is the main promotional advocate for white pine as a raw material. Promotional efforts include attending trade shows from various industries and producing information about white pine for trade show attendees. A number of outreach programs are directed at architects and other related professionals with the objective of educating potential users about the advantages of white pine. Promotional material such as brochures and information packets also are produced for distribution to interested parties. Finally, efforts have been made to organize contacts with international companies who may be interested in purchasing white pine lumber or related products. So far these efforts are in their rudimentary stages, but it is projected

that the program will increase in popularity following the looming economic rebound (Easterling, 2003).

Additional promotional efforts are also made individually by a small number of the larger white pine mills. These efforts are largely limited to brochures and other related reading materials distributed to contacts and customers.

Distribution



Source: Easterling, 2003.

Figure 15. White pine distribution flow diagram.

As is depicted in Figure 15, distribution of white pine lumber is typically done by means of a wholesaler who buys lumber (usually dry) directly from mills, sells it to a manufacturer, who then sells a finished product to the end user (i.e., flooring, windows, and etcetera). This can also be done directly, eliminating the wholesaler. It is also possible that an additional retail layer could be included in the distribution chain, such as a small neighborhood hardware store or lumber yard that stocks certain quantities of lumber for individual non-commercial consumers. Another distribution scenario would be a producer selling directly to the retailer, who then sells to an individual non-commercial consumer. This type of retailer is usually one of the larger franchise chains,

often referred to as a "Big Box" retailer, and can therefore buy in quantities large enough to bypass the wholesale channel (Easterling, 2003).

White Pine Market Characteristics

Eastern white pine (EWP) is used in many secondary wood manufacturing industries such as windows and doors, moulding, millwork, household furniture, component mills, flooring, cabinets, log homes, siding products, interior paneling, burial caskets, and in various arts and crafts applications. McDaniel (2003) reported the volumes of EWP lumber that are purchased by each of these industries across the entire US (Table 2).

Table 2. Lumber purchased by secondary industries nationwide.

Industry	Average Mill Lumber Input: Total (bdft)	Average Mill Lumber Input: Eastern White Pine (bdft)	Eastern White Pine usage, as percentage of total (%)
Windows and Doors	1,100,000	93,200	8.5
Millwork	2,800,000	33,300	1.2
Household Furniture	1,900,000	24,200	1.3
Components	3,900,000	12,100	0.3
Flooring	10,300,000	8,400	0.1
Cabinet	605,000	5,100	0.8

Source: McDaniel 2003.

As Table 2 indicates, EWP is a relatively small component of these manufacturing processes on a national scale. This would seem to contradict earlier sections of this paper proclaiming EWP's large importance to the economy, but earlier statements and data only applied to the eastern states that are to be included in this study, while Table 2 includes data from the entire US. While not applying strictly to the same geographical

regions, these figures can still be used to EWP's major secondary markets. From Table 2 we see that window and door manufacturers were by far the largest users of EWP lumber, while millwork and household furniture were also significant users. Again, it is thought that these numbers are significantly higher among industries in eastern regions.

EWP is also known to be used for log homes, siding products, and interior paneling. Usage volume estimates for these particular products were not available, although it is believed that their markets (both production and consumption) are highly concentrated in the eastern US. The most accurate picture that can be drawn of these industries is provided by the US Census Bureau, which tracks production data for SIC code 2429, entitled "Special product sawmills, not elsewhere classified." This category is described as containing:

> SIC 2429 - "Mills primarily engaged in manufacturing excelsior, wood shingles, and cooperage stock; and in sawing special products, not elsewhere classified."
>
> Source: US Census Bureau, Core Business Statistics Series, 2003.

Burial caskets also are frequently made from white pine (FPS, 1999). To get a feel for the overall health of these manufacturing categories, Table 3 presents a breakdown of operational statistics from these industries. As Table 3 indicates, dollar-value sales of burial caskets increased 20.7% from 1992 to 1997, while sales from special product sawmills decreased 13.4% in the same period. It should be noted that while EWP is a common burial casket material, there is no implication here that EWP is the species most used in casket construction.

Table 3. Common secondary industries utilizing eastern white pine lumber.

		SIC Codes	
		3995 - Burial caskets	2429 - Special product sawmills, not elsewhere classified
Establishments	1997	177	102
	1992	210	197
	% change	-15.7	-48.2
Sales (thousands of $)	1997	1,271,184	129,111
	1992	1,052,940	149,124
	% change	20.7	-13.4
Paid employees	1997	6,962	1,343
	1992	7,824	1,909
	% change	-11	-29.6
Annual payroll (thousands of $)	1997	212,491	27,935
	1992	196,114	34,948
	% change	8.4	-20.1

Source: US Census Bureau, Core Business Statistics Series, 2003.

Eastern white pine is also a preferred material for many artisans producing arts and crafts. This industry does not consume such high volumes of wood material as the various secondary manufacturing industries, but the value-added to the material after having been transformed into an artistic item can be much higher. Sales figures from artisan markets are difficult to attain, but the US Census Bureau dedicates two SIC codes to tracking statistics from the small but healthy retail arts and crafts industry. Descriptions of the SIC codes are as follows, while Table 4 includes statistical figures from these categories.

> SIC 5947 – "Establishments primarily engaged in the retail sale of combined lines of gifts and novelty merchandise, souvenirs, greeting cards, holiday decorations, and miscellaneous small art goods."
>
> SIC 5945 – "Establishments primarily engaged in the retail sale of toys, games, and hobby and craft kits and supplies."
>
> Source: US Census Bureau, Core Business Statistics Series, 2003.

Table 4. Arts and crafts industry figures, 1992 & 1997.

		SIC Codes	
		5947 - Gift, novelty, and souvenir shops	5945 - Hobby, toy, and game shops
Establishments	1997	37,285	10,824
	1992	34,647	10,860
	% change	7.6	-0.3
Sales (thousands of $)	1997	14,497,296	14,388,277
	1992	10,553,525	10,627,271
	% change	37.4	35.4
Paid employees	1997	208,371	111,757
	1992	164,311	94,804
	% change	26.8	17.9
Annual payroll (thousands of $)	1997	2,056,666	1,368,645
	1992	1,466,864	991,855
	% change	40.2	38

Source: US Census Bureau, Core Business Statistics Series, 2003.

As indicated in Table 4 businesses in these categories have increased sales by more than 35% from 1992 to 1997, along with hefty increases in employees and payroll. While these types of stores clearly make the bulk of their revenue from many other items, they are also the types of stores that stock certain quantities of wooden crafting supplies or finished woodcrafts. Therefore, a healthy outlook for these industries translates to promising markets for white pine producers. However, caution must be taken when interpreting figures from Table 3 and Table 4, as they take many regions and many products into account that do not concern this study, and as such are only useful for rough estimations of regions and products of interest to this study.

Eastern White Pine's Economic Importance to the Eastern US

Although EWP is taxonomically a softwood, the industry treats it as a hardwood for all intensive purposes. Its grading rules are all based on aesthetic criterion as with

most hardwood lumber, as opposed to traditional softwood grading rules which are based on strength (NeLMA, 2003). This visual grading scheme makes sense when one considers the most common end uses for white pine, which are mostly appearance rather than structural products. For marketing purposes, this also means that EWP competes mostly with other hardwoods in their many decorative markets. The traditionally desired species in this category are oak, maple, cherry, poplar, and other industrial hardwood species found within the US and abroad. The eastern region of the US is home to many of these species, which are all very valuable to their local economies and could benefit from some investigation themselves. With so many other important tree species growing in the area, one must ask, "Why worry about white pine? Why not let the market decide white pine's fate by natural means and let the economic system run by its own designs?"

The first part of the answer lies with landowners along the eastern US who collectively posses vast quantities of timberland and stand to lose a lot of potential value tied up in their white pine timber if higher-value markets cannot be found and their timber is subsequently sold at pulpwood prices if sold at all. According to statistics produced by the USDA Forest Service, eastern white/red pine is the largest specie group in the eastern states in terms of volume of sawtimber on timberland (in bdft). Figure 16 illustrates this relationship.

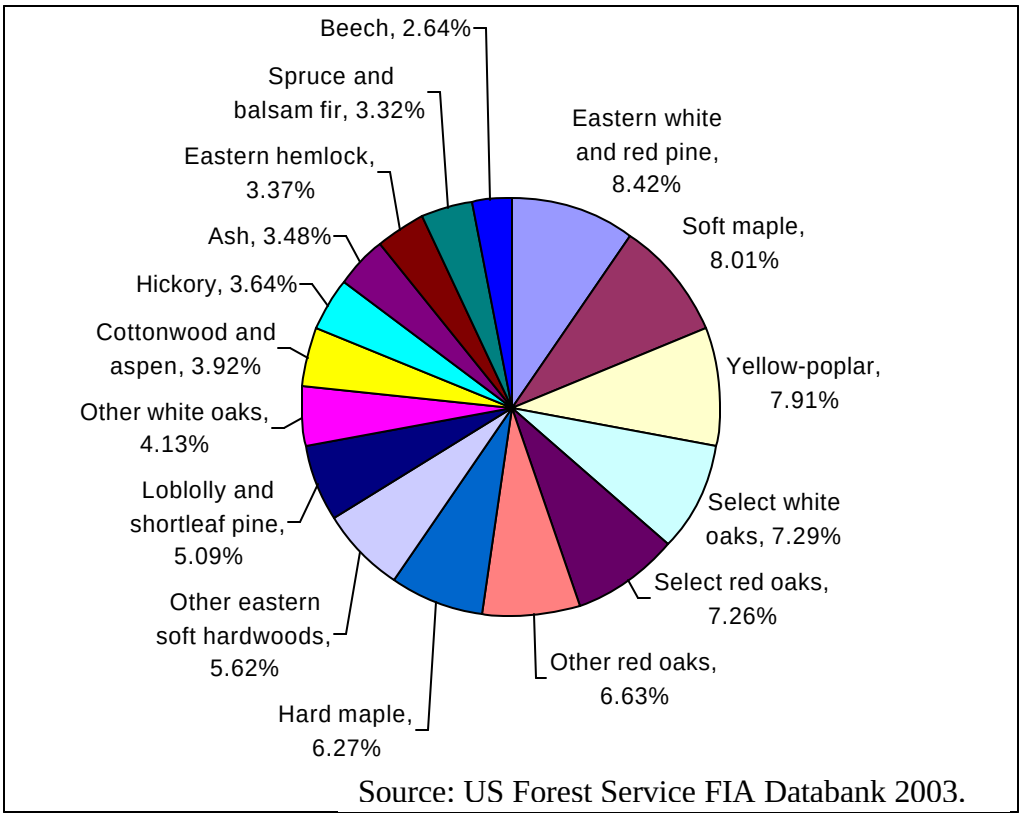


Figure 16. Volume of sawtimber on timberland - Percentages of the 16 highest-ranking specie groups across all states included in the study.

As can be seen in Figure 16, the eastern white/red pine group makes up 8.42% of the total sawtimber volume in the states included in this study, which leads all other categories for individual specie groups. When one considers this information, it becomes clear that the economy of the entire Eastern US would benefit from an improved capability to market this timber and capture more value from this portion of the forest resource. Eastern white pine's 8.42% represents about 77.6 billion board feet of sawtimber. A minority portion of that is red pine, but this timber can be considered the same as white pine in terms of landowner value as it is basically treated the same as white pine for marketing purposes (USDA Forest Products Lab, 1999). This huge reserve of material has the potential to stimulate a large amount of economic activity if proper

markets can be found and it is given a better chance to capture more value in those markets.

Generally, the higher valued products are made from white pine timber that is 4/4" nominal thickness lumber. From there it can be used in any of the previously mentioned markets that decorative lumber traditionally feeds into. In this way white pine is similar to hardwoods, following traditional product distribution channels. Alternatively, white pine can also be used to make chips for pulp stock or for OSB manufacture. Figure 17 depicts these channels with a typical production flow chart for white pine lumber. It should be noted that the chipping operation could be on-site or off-site.

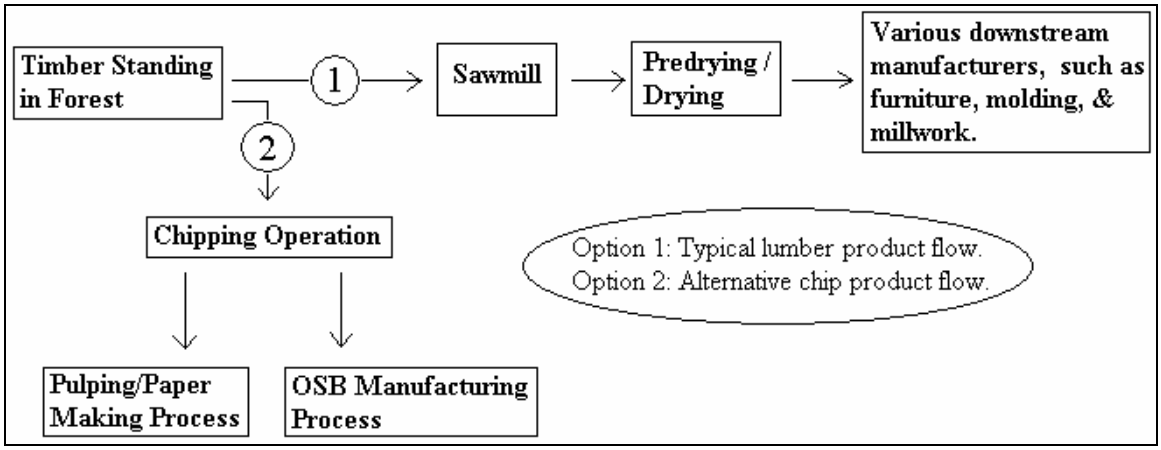


Figure 17. The two most common production paths for eastern white pine.

Currently, there exists no definitive answer for why some markets prefer more white pine lumber than others, but the difference in prices paid for white pine sawlogs and white pine pulp stock present a striking contrast. Table 5 illustrates this difference.

Table 5. Eastern white pine stumpage prices by region.*

Region	Mean Timber Stumpage Price ($/Mbf)	Mean Pulpwood Price ($/Mbf)**	Median Timber Stumpage Price ($/Mbf)	Median Pulpwood Price ($/Mbf)**
Mid-Atlantic States	88.33	2.08	90.00	2.08
Lake States	96.60	2.80	115.00	2.80
New England States	98.83	1.29	85.50	0.42
Aggregate	95.79	1.80	88.00	1.45

* All prices based on international ¼ scale.
** Pulpwood prices transferred from $/cord on a 1:415 cord to board foot ratio.

Source: Various institutions reporting prices for individual states or regions; see Literature Cited for individual listings.

A glance at Table 5 will show that price differentials are significant; prices for timber stumpage are overwhelmingly higher than pulpwood stumpage. It must also be considered that selling just high-grade or low-grade will produce higher or lower prices, respectively, but even the lowest quality sawlogs would still fetch a higher price than pulp wood.

This general trend is not unique to eastern white pine, as large price differentials can also be witnessed in other markets. *Timber Mart – South* (Baldwin, 2003) publishes average stumpage prices for sawtimber and pulpwood in the southeastern US, and examining this data shows that pulp stumpage prices are consistently lower than sawtimber stumpage prices, regardless of grade, species, or season. Figure 18a& b illustrates this relationship.

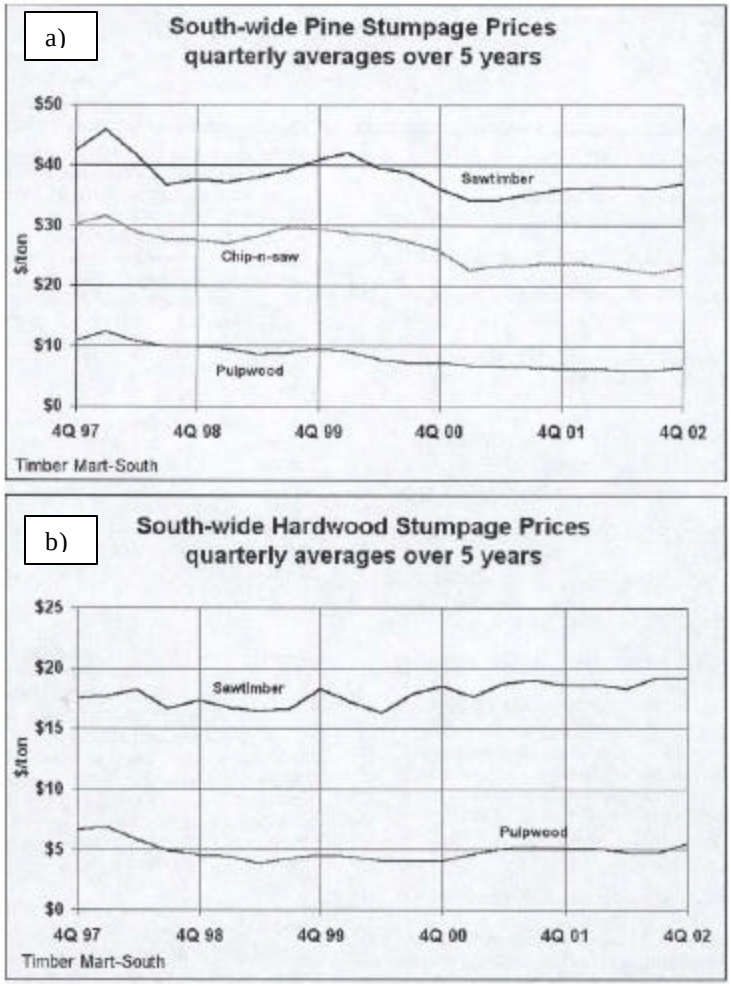


Figure 18. Two stumpage price charts. Source: Baldwin, 2003.

As these graphs indicate, pulpwood stumpage prices have been consistently lower than sawtimber prices during the past 5 years. These figures are different than the ones in Table 5 because they are reported in $/ton, as opposed to $/Mbf. It is also interesting that the ratio of sawtimber price to pulpwood price is much lower than in Table 5. This is attributable to the fact that the Timber Mart – South data in Figure 18a covers all pine species (as opposed to only white pine) within a larger southeastern state region than in Table 5.

Having established that eastern white pine is the single largest component of forests in the eastern US, and having illustrated the large difference between pulpwood

prices and sawtimber prices, it becomes evident that white pine could have a meaningful impact on the eastern US economy by moving into higher value uses. However, white pine's influence does not rest solely with landowners seeking a profit from their timber holdings; the sawmilling industry also relies heavily on white pine timber to feed its production lines. According to the US Census Bureau (1997-2001), white pine has been one of the top species used for milling into lumber for the past 5 years in the eastern US. Without a continued demand for white pine lumber, eastern US sawmills would lose one of the key species keeping their mills in operation.

To better understand eastern white pine's place in the hierarchy of decorative wood species, Figure 19 provides a comparison of the most commonly used eastern US decorative wood species' production figures during the past five years. The graph clearly indicates that eastern white pine is a significant industrial species, ranking #4 out of the top 14. It is not surprising that red oak, white oak, and yellow-poplar lead white pine in annual board foot production, but it is interesting to note that more white pine is produced than many other popular decorative species such as maple, cherry, and ash. This ranking places a high importance on the future of US white pine markets, as this species constitutes such a large portion of economic activity on the east coast.

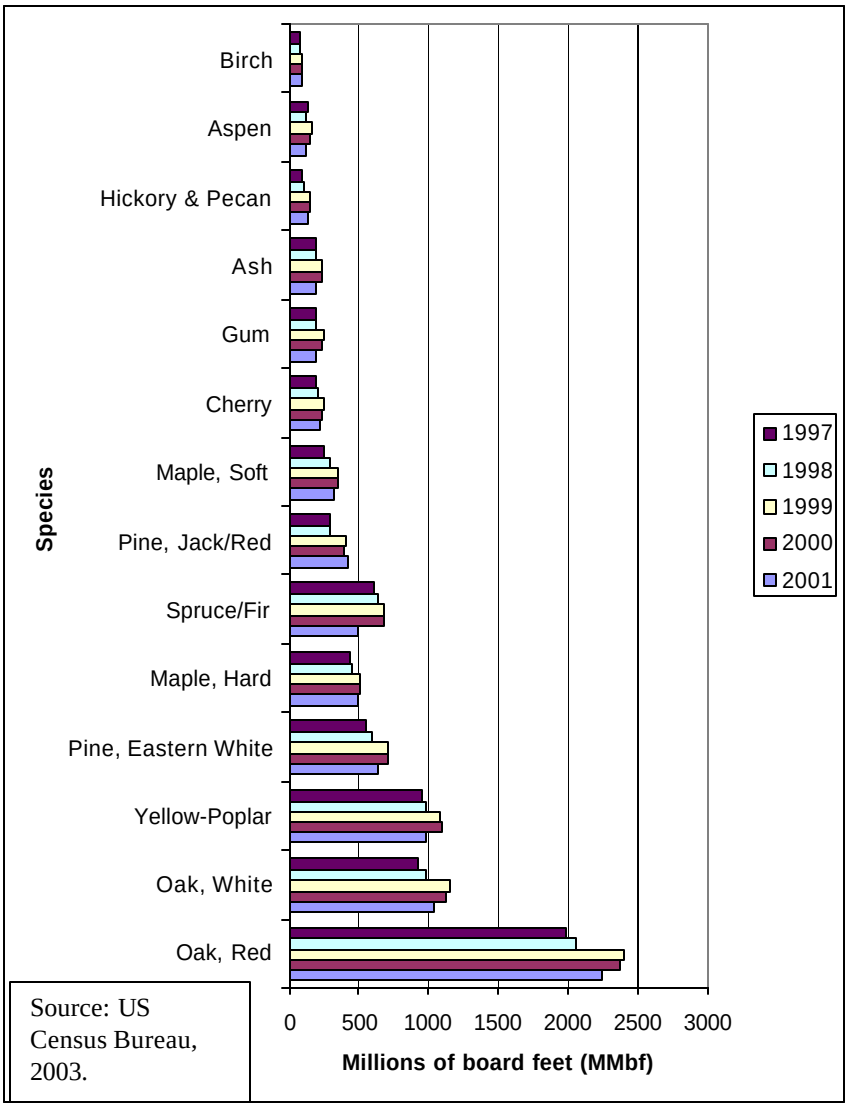


Figure 19. Comparison of annual production figures for most commonly used eastern decorative wood species, past 5 years.

The Eastern White Pine Situation

With eastern white pine (EWP) playing such an important role in the eastern US forest products markets, it makes sense to monitor its utilization as a natural resource and investigate any unusual developments that should occur. One such development was noticed in the late 1990's, when it was observed that sawtimber volumes in the Mid-Atlantic and Lake States had increased tremendously in comparison to the New England

States. This growth occurred between the late 1970's and the early 1990's, and was estimated at 143% in the Mid-Atlantic/Southern States and 43% in the Lake States, with only 17% growth in the New England States (Weidenbeck, 2003; Irland, 1999 "Eastern White Pine"). New England has been the traditional market for white pine, with a long history of producing lumber from the specie dating back to colonial times. Other regions, however, do not have such a long history with the material, and therefore do not posses such an established infrastructure or such robust markets.

Sawlog Inventories Across the Three Regions

With such rapidly increasing white pine volumes destined for such small markets, industry analysts have begun to worry about possible oversupply situations that may take place if these large growing stocks flood the market. The best way to avoid such a predicament while retaining natural resource value for land owners would be to expand current or create new markets for this growing supply of white pine, thus increasing demand. Further, these new markets would preferably be for higher-value products, such as lumber, in lieu of lower-value products such as pulp stock/chips or pallet cants.

Based on these assertions, an investigation was performed using the USDA Forest Service Forest Inventory Analysis (FIA) system to obtain the most current information available regarding the volume of white pine sawtimber standing in each region's forests (USDA Forest Service, 2003). It should be noted that this analysis provides only an approximation, as survey methods and techniques can vary by region and across time intervals. However, this is the best information of its kind available. A summary of the results is given below in Table 6.

Table 6. A regional comparison of white pine sawtimber standing volumes and annual removals.

	Million board feet (MMbf)			
Mid-Atlantic States	1980 to '90	'90 to '03	Change	%
Volume of Sawtimber on Timberland	8,465.94	11,005.61	2,539.67	30.00%
Removals of Sawtimber on Timberland	132.002	192.61	60.61	45.91%
Harvest to Volume Ratio	1.56%	1.75%		
Lake States	1980 to '90	'90 to '03	Change	%
Volume of Sawtimber on Timberland	7,286.76	14,661.37	7,374.61	101.21%
Removals of Sawtimber on Timberland	27.658	65.814	38.16	137.96%
Harvest to Volume Ratio	0.38%	0.45%		
New England States	1980 to '90	'90 to '03	Change	%
Volume of Sawtimber on Timberland	19,499.77	25,948.88	6,449.11	33.07%
Removals of Sawtimber on Timberland	73.531	49.601	-23.93	-32.54%
Harvest to Volume Ratio	0.38%	0.19%		

Source: USDA Forest Service Inventory Analysis, 2003.

The results indicate that earlier white pine sawtimber volume estimates were correct in their general conclusions about sawtimber volumes increasing at different rates between regions, although current USFS forest inventory data indicates that the specific volume estimates are now outdated and inaccurate. For example, Mid-Atlantic volume growth since 1980 is now estimated at 30%, down from the 143% reported in 1999, and Lake States volume growth is now estimated at 101%, up from 43% in 1999. The change in these numbers since 1999 seems sudden, but the quick number jumps are mostly due to high and low in-growth rates (trees crossing the minimum diameter to be considered sawtimber) in Lake and Mid-Atlantic States regions, respectively (Irland, 1999 "Eastern White Pine"). To compare, New England shows a 33% increase in sawtimber volume, which shows that EWP stocks in the Lake State and Mid-Atlantic regions are indeed growing at a faster rate than in New England though not as much as earlier predictions estimated.

While these increases in sawtimber volume are concerning, the most revealing data relate to white pine sawtimber removals in the three regions. Table 6 shows that removals in Lake State and Mid-Atlantic regions increased significantly since 1980 (138% and 46%, respectively), but there was a 33% decrease in removals from the New England region. This decreasing removal rate has made New England the smallest producer of EWP of the three regions (although it was second in 1980, behind the Mid-Atlantic States). This is rather surprising considering New England's historically strong white pine markets, but there are many possible causes for the decrease. One example would be the recent series of pulp-mill closings in the New England area (Irland, 1995), while another explanation may be that consumers are shifting tastes and preferences and simply demand fewer white pine products.

Alternatively, this increase in EWP timber volumes may be caused by better forest management practices or more farmland reverting to forestland rather than a lack of harvesting. Whatever the cause, the increasing volume of EWP raises many questions about the state of the EWP industry and its ability to market this raw material.

Eastern White Pine's Tendency Toward Low-Value Products

Unfortunately, this is not the only problem facing the industry. As stated earlier, directing EWP into high-value markets is crucial to achieving an economic benefit for timberland owners and sawmills operators. Unfortunately, many sources indicate that quite the opposite is happening. It is believed that EWP timber is used for low-value pulp/OSB chips much more frequently in Mid-Atlantic and Lake States than in New England (Wiedenbeck, 2003). If this is the case, then it is possible that much of this material could be used for lumber or other high-value products. Comparing these three

regions will detect this trend, and also help to identify possible solutions that are working in some regions that may be transferred to others.

Possible Preference for New England-Grown Eastern White Pine

Lastly, it has been suggested that secondary manufacturers in Mid-Atlantic and Lake State regions may be purchasing their white pine lumber from mills in New England (Wiedenbeck, 2003). With such large stocks of this species grown locally in each region, manufacturers must have strong motivation to buy material from such comparatively distant locations and shoulder the associated transportations costs. These motivations are largely unknown, but a very likely reason could be that New England EWP lumber is perceived to have a higher quality than the same species grown in other regions. This explanation would concur with earlier findings that white pine grows much faster in Mid-Atlantic states than in New England states due to a more favorable climate (Irland, 1999 "Eastern White Pine"), which may lead to differences in lumber attributes.

The Influence of Radiata Pine

Perhaps the most noticeable development in the white pine industry within the past 10 years has been the influx of radiata pine into the marketplace. This species, mostly imported from Chile and New Zealand, offers a good quality material that is visually similar to EWP and ponderosa pine at a cheaper price. While radiata's effects have already been noted in US markets, analysts agree that we are only seeing the beginning of New Zealand and Chile's export capabilities. New Zealand currently has about 1.6 million hectares (4 million acres) of radiata pine in plantations, and harvests about 19 million m^3 (8.1 billion bdft) annually. This figure is estimated to potentially

grow to 35 million m^3 (14.8 billion bdft) by 2015 and 50 million m^3 (21.2 billion bdft) by 2025 (Markets New Zealand "Douglas Fir…", 2003). These estimates represent huge growth in radiata pine supplies in coming years, and the US is expected to import the largest share of this material. While New Zealand has many markets for its radiata pine lumber, such as Australia, Japan, and China, the US is still the most significant importer (Markets New Zealand "Douglas Fir…", 2003). Additionally, imports from Chile to the US are around 5 million m^3 (2.1 billion bdft) and rising, adding significantly to the radiata pine import total (Jélvez et. al., 1989).

These looming increases in radiata pine supplies pose a direct threat to white pine's profitability, as the two share many common attributes and markets. Radiata pine has become an accepted substitute for white pine and ponderosa pine in moulding and millwork as well as furniture applications (Wengert, 2001; Harding, 1998; Harding et. al. 1999). Intensively pruned radiata pine, which is the main component of New Zealand's plantation stock, is also gaining a reputation for having high yields of long clear lumber; an attribute that white pine cannot often claim (Market New Zealand "New Zealand…", 2003; Horgan and Maplesden, 1997). These three factors: 1) radiata pine's rapidly increasing export potential from New Zealand and Chile, 2) competitive price, and 3) substitutability for white pine – all come together to form a potent threat to the future of white pine markets. A better understanding of radiata pine's current market position in relation to white pine is crucial to reducing these undesirable effects.

Despite its many advantages, radiata pine does have a few faults; the most notable of which is its tendency to develop a brown colored stain during the kiln-drying process. The brown stain develops directly beneath the lumber's outer surface but becomes visible

after further processing such as planing and sanding (Kreber and Haslett, 1997). This kiln stain, or "sap stain", has been a common problem for exporters trying to break radiata pine into decorative markets such as moulding, millwork, and paneling, where such discoloration is highly undesirable. Treatments such as compression rolling prior to drying have been shown to reduce the extent of sap stain, but they add expense to the drying process, and there is no method that can completely eliminate this drying defect (Kreber and Haslett, 1997). White pine has been known to have similar problems, but anecdotal evidence suggests it is to a lesser extent; drying directly after sawing using low relative humidities (and temperatures of less than 130º F when lumber is above 30% MC) should be enough to eliminate any stain (Wengert, 2001).

Methodology

Objectives Restated

1. Identify differences in eastern white pine market characteristics between New England, Mid-Atlantic, and Lake State regions of the US, as they pertain to both primary and secondary industries.
2. Identify differences between primary and secondary manufacturers in terms of desired product attributes that may impede the efficient marketing of eastern white pine lumber.

Data Collection

Data was collected for this research both by means of a mail survey and by personal interviews with industry members knowledgeable of white pine markets. These two methods were useful for offering insight into the two main objectives of the study. It

was also possible to analyze a select group of individual secondary markets to test for differences between these markets.

In this study the New England States were defined as Connecticut, Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts. The Mid-Atlantic States were defined as Kentucky, Maryland, New York, North Carolina, Pennsylvania, Tennessee, Virginia, and West Virginia. The Lake States were defined as Illinois, Indiana, Minnesota, Michigan, Ohio, and Wisconsin. These regions were chosen based on previous studies citing similar territory boundaries, and citing the included states as significant players in white pine markets (Irland, 1999 "Eastern White Pine"; Weidenbeck, 2003).

Sample Frame

The sample frame for the mail survey was taken from forest industry directories produced by various authorities within each individual state. Mills were chosen that either identified white pine as a utilized species or mills that do not necessarily specify EWP but still run a high likelihood of using that species. An example would be a mill description in a directory such as "hardwood and softwood sawmill", because EWP is often sawn in the same mills as hardwoods. The population of interest was: 1) sawmills that produce EWP lumber and 2) secondary manufacturers of EWP products. The data collected from the sample frame was able to provide general conclusions specifically pertaining to the EWP milling industry, such as average size, production, product preferences, and other marketing data relating to research objectives 1 and 2. The NeLMA membership directory (2003) was also used to develop addresses.

When surveying the two industry groups (primary and secondary), an effort was made to characterize mills as either primary or secondary processors. Due to incomplete information from many of the industry directories from each state, this distinction was often difficult to make. Therefore, a question was added to the questionnaire asking respondents to identify their mill type. The questionnaire mailed to primary manufacturers asked those who identified themselves as secondary mills to close the questionnaire booklet and return it as is. These respondents were then sent a follow-up questionnaire for secondary manufacturers. The same procedure applied to questionnaires sent to secondary manufacturers.

Based on preliminary observations of state forest products directories, it was believed that there may be anywhere from 1,000 to 4,000 secondary manufacturers utilizing EWP within the study region. To ensure sufficient sample sizes, an equation for developing statistically significant sample sizes developed by Ballenger and McCune was applied (Ballenger and McCune, 1990). The equation is based on the premise that sample size should be derived from the question introducing the most variation into the survey. For this survey, a question using a Likert-type scale of 1 to 7 for the rating of certain variables was determined to have the highest variance. The equation and calculations are as follows:

$$n = [(Z_{a/2})^2 (s)^2] / h^2$$

Where:
- n = sample size
- $Z_{a/2}$ = reliability coefficient
- s = estimated population standard deviation
- h = allowable tolerance level

With the use of a 95% confidence level, the calculations are as follows.

$Z_{a/2} = 1.96$
s = (max value – min value)/6 = (7-1)/6 = 1
h = ± 0.2 for a = 0.05

$n = [(1.96)^2(1)^2] / (0.2)^2 = 96.04$ rounded to 97

Therefore, a sample of roughly 100 respondents was desired from each group being compared. Using a conservative response rate estimate of 20%, it was determined that 500 questionnaires were to be sent to secondary manufacturers in each region, assuming a sufficient supply of addresses.

Regarding primary white pine manufacturers, sawmill sample size was determined by the number of existing white pine sawmills, and therefore a census was attempted for this group.

Questionnaire Description

The questionnaire began by asking questionnaire recipients if they use EWP in any aspect of their operation. Participants were asked to identify their mill-type (primary, secondary), and the product category that best described the products produced at their facility. They were then asked demographic and volume questions. This was followed by a series of questions asking to rate their opinions on various EWP resource, product, and market characteristics on a Likert-type scale of 1 to 7. This allowed for comparison between regions and primary and secondary manufacturers.

The survey consisted of two separate and unique questionnaires, one targeted at primary manufacturers and one at secondary manufacturers. Each questionnaire was 6 pages in length. The questionnaire booklets were printed in 6 separate colors, which

denoted the three regions within the two industries (primary and secondary). This was done for sorting and organization purposes only. The first two questions served as qualification questions; the first asking if the respondent used EWP, and the second asking for primary vs. secondary industry identification. Those not using EWP were recorded as "bad addresses" and removed from the mailing list. Respondents receiving the wrong questionnaire (i.e., a sawmill receiving a secondary questionnaire) were then sent a correct follow-up questionnaire. Additionally, before the final copy was mailed out, the questionnaire was pre-tested by faculty and industry representatives who made suggestions and corrections.

Data Analysis

The data was collected and entered into the SPSS Statistical Software Package (SPSS Inc., 2003) for analysis. Dates of receipt were recorded for each questionnaire for the purpose of non-response bias testing. Questions that address quantities of material purchased or produced were compiled and presented for comparison. This and all other data (including question requesting a 1 to 7 rating on a Likert-type scale) was also analyzed using analysis of variance (ANOVA) where applicable. The Tukey's least significant difference (LSD) post hoc test was then used to identify individual differences within the sample. Open-ended questions asking for additional descriptive information were asked at the end of the questionnaire, giving respondents the opportunity to voice their opinion on a topic that may have been missed by the questionnaire.

Non-response bias was analyzed for this survey using two methods. The first was adopted from previous studies of a similar nature, and involved contacting 30 non-respondents and asking them a sample of 5 questions from the survey (McDaniel, 2003;

Olah, 2000; Cumbo, 1999). Comparing this data to the original data showed how similar respondents were to non-respondents, and thus predicted how well the results applied to the entire population rather than just the particular sample that was collected. The number 30 was used because at this number a population begins to resemble a normal distribution. The data was compared using a two-way t-test of independent means. Second, it is shown that comparing early respondents to late respondents is a useful method for testing non-response bias, as late respondents often closely resemble the answers given by non-respondents (Armstrong and Overton, 1977). To do this, the first 30 and the last 30 respondents were compared against each other. When the two groups have similar answers, it suggests that non-response bias is low, and likewise, a lower similarity suggests a higher non-response bias. Again, this data was compared using a two-way t-test of independent means

Interviews with Industry Personnel

Once the mail survey analysis was completed, the second part of this research was to visit mills in the three regions to compare their experience with results of the survey. A total of 19 mills were visited within the study region: 6 from New England, 6 from the Mid-Atlantic, and 7 in the Lake State region. Four primary and 7 secondary manufacturers were visited, and another 8 mills visited were involved in both operations. During the interviews, the subjects were shown 2 photographs of EWP boards. Each photograph contained three groups of boards, with each group consisting of three individual boards. The three groups in the picture represented EWP from the three separate regions included in the study. The first photograph left the three regions unlabeled, and generically referred to them and Groups 1, 2, and 3. The second

photograph identified the regions that the boards came from. Interviewees were asked to rank the three groups in each photograph based on a series of characteristics that were discernable from the photograph. Efforts were made to keep the quality of the boards consistent between groups and photos. These responses were then tallied and compared to look for trends that may indicate bias for lumber from a certain region; the theory being that the responses should be similar between the two photographs if no bias existed. Interviewees were also asked a series of questions aimed at gathering additional qualitative information and validating the results of the mail survey. This combination of both quantitative and qualitative information is called *pluralistic research*, and utilizing this method can greatly increase the accuracy of the study by benefiting from the advantages of both types of information while minimizing the disadvantages (Burns and Bush, 2000). This is because the weaknesses of one method are compensated for by the strength of the other, and vise versa. Therefore, both techniques were used in the study.

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Chapter 2: Regional Assessment of Primary Markets for Eastern White Pine

Introduction

Eastern white pine (*Pinus strobus*) is a very significant species to the forest products industry in the eastern United States. It represents approximately 8.4% of the total volume of sawtimber on viable timberland, representing about 77.6 billion board feet of sawtimber (US Forest Service FIA Databank, 2003). With eastern white pine (EWP) representing such a large portion of eastern forests, there is a significant landowner interest in capturing more value from this material. Furthermore, EWP ranks 4th among species in its markets in overall production along the Eastern US. This represents approximately 600 million board feet produced annually in eastern sawmills, which is more than either hard or soft maple, spruce/fir, cherry, ash, or hickory (alone, not combined) (US Census Bureau, 2003).

Despite the large quantities of EWP available in eastern forests, and its importance to the industry as a raw material, there has been speculation that EWP has not been capturing its potential value in many regions of the US for a number of reasons. First, it has been suggested that a growing disparity exists between the amount of EWP available in certain regions of the US and the amount being harvested in those regions. This disparity developed from the 1970's through the 1990's, and it now has begun to raise debate as to why certain regions are not making full use of their raw material (Irland, 1999 "Eastern White Pine"; Wiedenbeck, 2003). Some of the suggested reasons are quality differences, availability, production limitations, or competition from foreign species.

Aside from production issues, there is also a concern of high-value versus low-value products being produced from white pine roundwood. A general trend has been noted in the Mid-Atlantic and Lake States towards using white pine timber to produce more low-value products such as pulp stock, pallet cants, and OSB chips, whereas the New England area tends to produce more high-value lumber (Wiedenbeck, 2003). This has serious implications for landowners interested in selling timber in these regions. Further, finding higher-value markets for timber would not only serve individual landowners but also boost local economies by increasing the value of all white pine forestlands and allowing more profit to be made at each level of the distribution chain.

Another topic is the observation that sawmills in the Mid-Atlantic and Lake State regions are indeed sawing a significant amount of white pine, but they are buying the logs from the New England area (Wiedenbeck, 2003). Considering the ample local white pine supplies in these regions, one would immediately postulate that some type of quality difference exists between the regions, but this does not necessarily have to be the case. Quality differences may be perceptual and not based on actual differences. Alternatively, white pine may be difficult to access in certain areas, or local supplies may not be consistent enough to depend on for continuous production. Whatever the reason, it is certain that many parties stand to benefit from the improved raw material utilization that would result from an increased understanding of these markets.

Finally, there is the issue of imported species and the pressure that they are placing on markets for domestic species. Radiata pine's rapid influx into the market has been well documented during the past 10 years, and its extremely competitive price has threatened those markets it has entered. Many of radiata pine's applications, such as

moulding, millwork, and other milled dimension parts, are shared with eastern white pine, making the two species direct competitors (Horgen and Maplesden, 1997; Harding et. al. 1999). Compounding the situation, New Zealand and Chile currently report huge growing volumes of radiata pine in their countries, which means that supplies to the US are likely to increase or at least hold steady for the next 10 years (Jélves et. al. 1989; Horgen and Maplesden, 1997). None of this implies that white pine is facing unavoidable decline, but it is clear that action must be taken to investigate market opportunities for white pine if eastern forests are to realize their full economic potential.

Research Objective

1. To assess and compare market characteristics of the eastern white pine industry in the New England, Mid-Atlantic, and Lake State regions of the United States.

Methodology

This research was conducted with a mail survey that utilized a questionnaire to gather information from primary eastern white pine manufacturers on markets for eastern white pine (EWP). Once developed, this questionnaire was reviewed by the research committee, revised, and then pretested among industry representatives who were instructed to look for confusing or misleading questions, as well as suggest any topics that they felt to be important that may have been missed.

The population of interest to this study was EWP producers in three regions of the Eastern US: Lake States (IL, IN, MI, MN, OH, WI), Mid-Atlantic States (KY, MD, NY, MC, PA, TN, WV, VA), and New England States (CT, ME, MA, NH, RI, VT). The sample frame from each region was developed on a state-by-state basis by contacting local authorities in charge of tracking the forest products industry in each particular state

and requesting copies of industry directories. Directories that indicated species use were preferred but not always available.

Once pretesting was finished and the sample frame completed, the initial mailing was sent out to a total of 1,292 primary manufacturers in April 2004. This first mailing was then followed by a follow-up postcard approximately three weeks later, a second questionnaire after another two weeks, and a second reminder postcard after another three weeks. Responses were cut off at the beginning of July 2004. Completed questionnaires were entered into the SPSS statistical software package, in conjunction with Microsoft Excel, for analysis. A copy of this questionnaire is included in the appendix (see Appendix 1).

As a test for non-response bias, 30 primary manufacturers were contacted from the list of non-respondents. These non-respondents were asked to estimate their total annual EWP production and to rate four of the factors listed in the original questionnaire. This data was compared to the data received from the questionnaire, looking for statistical differences between the two groups. The same comparisons were made between early and late respondents. Similarity between these groups would indicate that the results of the survey represent the whole population.

Results

A total of 1,292 questionnaires were sent to primary manufacturers. The regional response rate is broken down in Table 7.

Table 7. Regional breakdown of response rate.

	New England	Mid-Atlantic	Lake States	Total
Questionnaires sent	292	500	500	1292
Completed questionnaires returned	68	61	56	185
Unadjusted response rate	23.3%	12.2%	11.2%	14.3%
Unusable questionnaires	153	114	174	441
Adjusted response rate	48.9%	15.8%	17.2%	21.7%

In Table 7, the unadjusted response rate is the number of usable questionnaires returned divided by the total amount sent. The adjusted response rate was then calculated to account for bad addresses and questionnaires that were returned from mills that reported producing no eastern white pine (labeled "unusable questionnaires" in Table 7). It is possible that some of the bad addresses were a result of canceled rural postal routes, changed zip codes or PO boxes, etc. The adjusted response rate was calculated by dividing the amount of completed questionnaires by the new total number of questionnaires after subtracting the unusable questionnaires from the total sent. The equation would appear as

Adjusted Response Rate = Completed Questionnaires / (Total Sent – Unusable)

The best response was received from the New England region, 48.9% adjusted. The Mid-Atlantic and Lake State regions were roughly similar to each other, with adjusted response rates of 15.8% and 17.2%, respectively. The large response rate for

New England implies that primary producers of EWP in the New England region may have more of an interest in EWP markets than the other two regions. This may be caused by the robust markets that traditionally exist for EWP in New England, or the strong presence of trade associations catering to this species in the area (i.e., NeLMA). Indeed, results show that 22 NeLMA members responded to the survey, yielding a 40% response rate among NeLMA members who are involved in EWP production.

Non-Response Bias

Two types of non-response bias were tested for this data. The first compared the core survey data to a sample of 30 non-respondents who were contacted by phone after the completion of the data collection. These 30 non-respondents were asked four rating-style questions and asked to estimate their total annual EWP production. The two product attributes with the highest and lowest overall ratings were selected from Table 22 ("color" and "strength", respectively), as well as the highest and lowest overall rated service characteristics from Table 23 ("good reputation" and "flexible payment", respectively). The highest and lowest rated attributes were chosen from each question because it was believed that they would be the strongest detectors of bias. An ANOVA was performed on these questions and the production estimates at the $a = 0.05$ significance level. No differences were found between the two groups regarding strength, good reputation, flexible payment, or production volume. However, a highly significant difference was found between the two groups regarding color, with the original respondents rating color significantly higher than non-respondents (means: 5.28 vs. 4.43, respectively; p-value < 0.01). This is likely caused by the fact that original

respondents may have been more interested in EWP, and color may have been more of an important issue to them.

The second test compared answers from the first 30 respondents with the last 30 respondents, and the same analysis and questions were used for this comparison as with the first non-response test. No significant differences were found between early and late respondents regarding color, strength, good reputation, or flexible payment. However, early respondents reported a significantly higher mean annual EWP production (5,523,000 bdft) than did late respondents (290,000 bdft), with p-value < 0.01. This shows that late respondents may have been less involved in EWP markets, and were therefore less interested in the survey. Overall, there were few differences between the two groups regarding non-response bias, and this general concurrence among the strongest indicators of bias suggests that the results of the study can be reliably applied to the general population.

Market Demographics

A number of questions in the questionnaire asked respondents to identify certain demographical characteristics about themselves. This information allows for a more detailed profile for mills in each region. By asking questions such as total sales, total employees, and number of mills owned by the company, it is possible to form a clearer picture of how mills in each region may differ. The first such question asked respondents to estimate total gross sales at their specific mill location for the year 2003 (Table 8). Options given ranged from “Less than $1,000,000” to “Greater than $50,000,000”.

Table 8. Total annual sales among primary manufacturers of EWP.

	Mill tally by region		
Total Sales ($)	Lake States	Mid-Atlantic	New England
< 1 mil	36	20	19
1-5 mil	10	19	18
5-15 mil	5	8	11
15-25 mil	1	3	3
25-50 mil	1	3	5
> 50 mil	0	1	3

From the data in Table 8, it appears as if Mid-Atlantic and New England Regions are reasonably close in their distributions of total sales. However, the Lake State region has more mills with total sales under $1 million, which implies that the average sales for an EWP mill in this region are less that that of the other two regions. It should be noted that these sales figures are for all products and not just EWP.

Table 9. Titles of respondents filling out questionnaire.

Title of respondent completing questionnaire			
	Lake States (N=54)	Mid Atlantic (N=62)	New England (N=66)
President	28%	26%	35%
Vice President	7%	11%	12%
Owner	59%	34%	30%
Manager	2%	15%	14%
Sales	4%	3%	2%
Other	0%	11%	8%
Total	100%	100%	100%

Table 9 indicates that most respondents were either an owner or a president in all three regions. Noticeably more respondents in the Lake States were owners rather than presidents, and there were few respondents of any other type. The Mid-Atlantic and New England regions were more closely divided between the amount of owners and presidents responding, and more responses came from other titles, most of which were managers or vice presidents. Few respondents were in the other category, which most fill-in responses

revealed were more specific types of managers (i.e., general manager, plant manager) or corporate officers (COO, CFO, etc.).

Table 10. Number of employees at respondent's mill, by region.

	Employee tally by region		
No. of employees	Lake States	Mid-Atlantic	New England
< 25	45	41	44
25-50	8	9	7
51-100	0	6	8
101-200	1	4	4
201-300	0	1	1

Table 10 indicates that employment figures are basically similar in all three regions, especially in categories at or below 50 employees per mill. However, the Mid-Atlantic and New England regions tended to have more mills employing 51 people or more that the Lake State region. This means that large-scale EWP production may be more prevalent in the New England and Mid-Atlantic regions.

A final demographical question asked respondents to state whether their company is a single or multiple facility operation. Answers were similar in all three regions, as is indicated in Table 11.

Table 11. Company operates a single facility vs. multiple facilities.

No. of facilities	Lake States	Mid-Atlantic	New England
Single	49	52	55
Multiple	5	10	8

Primary Eastern White Pine Market Characteristics

An attempt was made to estimate average annual production at eastern white pine (EWP) mills in the three regions. Many factors made such estimation difficult due to the skewed nature of the data. The results are as follows in Table 12.

Table 12. Average eastern white pine mill production (figures in bdft).

	N	All Data, Unadjusted		Excluding outliers past 3 St. Dev. of original mean	
		Average	St. Dev.	Average	Median
NE	61	7,601,218	15,041,766	4,654,729	500,000
MA	57	2,082,443	4,555,291	1,637,486	400,000
LS	54	441,088	1,194,785	290,920	100,000

Table 12 illustrates that there was much variation in measuring average mill production depending on the method used for measurement. An unadjusted overall mean was very high as compared with the median. This is due to a relatively small number of mills producing disproportionately more volume than most mills, which created a skewed distribution toward larger production numbers. To counter this effect, outliers were identified as those outside 3 standard deviations of the original mean. A new mean and median were then calculated excluding those outliers. As shown in the table, there is still a relatively large gap between the mean and median estimates of average production. Based on the sample frame being skewed toward smaller mills, it would be reasonable to state that the most typical EWP mill size in each region will be close to or slightly larger than the median size given in Table 12. Additionally, it is interesting to note that this survey captured 58.6% of total NeLMA EWP production, out of an estimated total of 624 million bdft of annual production among NeLMA members (NeLMA Directory, 2003).

To estimate the general trends in market size, respondents were asked to predict whether they plan to increase, decrease, or remain constant in their EWP lumber production volumes during the next 5 years, and estimate the percent change. This data was compared to responses for total EWP lumber production to generate an estimate of change in EWP production. For example, if the respondent answered that they produced one MMbf of EWP, and they plan to increase production by 20%, then the net change would be an increase of 200,000 bf. All of these net change values were summed and then divided by the sum of EWP lumber production within the sample to give an estimation of market size change during the next 5 years. Estimates of percent change are based solely on data received from respondents. Table 13 summarizes these results, along with market size estimations.

Table 13. Predicted EWP growth trends within the primary industry, by region.

	Region		
	New England	Mid-Atlantic	Lake States
Total produced (thousand bdft)	463,674	118,699	23,819
Net change (thousand bdft)	33,780	5,378	2,542
Percent change	7.3%	4.5%	10.7%

According to the estimations in Table 13, there will be growth in primary EWP markets across all three regions. The Lake State region plans to grow at the fastest pace, at 10.7% during the next 5 years. The Mid-Atlantic region seems to be increasing at the slowest pace at 4.5%, with New England growing modestly at 7.3% during the next 5 years. The NeLMA membership directory estimates that its membership produces approximately 600 million bdft of EWP annually (NeLMA, 2003), so applying the 7.3% growth rate to that volume alone accounts for an increase of about 44 million bdft during the next 5 years in New England.

An attempt was made to characterize the typical primary EWP mill by species produced. This was done to look for trends among the three regions concerning EWP production methods, and how they fit into the product mix. This characterization was performed by asking participants to estimate the percentage of various species that they produce from a list provided. These percentages were then converted to actual figures based on their earlier estimate of total production. The total production for each species was then calculated, and divided by total production for all species on a regional basis. A high percentage of EWP production as compared to the total indicates that mills in that region are more focused on EWP, while a low percentage will indicate that EWP is more of a byproduct of hardwood production. Figure 20 provides results for the entire primary EWP industry overall and by region.

Figure 20 illustrates that most EWP mills in New England have a high percentage of EWP production, with no other significant production except for the "Sp/Hem/Fir" category (Spruce/Hemlock/Fir). This indicates that many New England mills depend completely on EWP, with little production of other species. Alternatively, EWP mills in the other two regions mainly depend on a large mix of other species. This may lead to disadvantages in production efficiencies for Lake and Mid-Atlantic States because there is less specialization in EWP production. However, this is also an advantage for these mills because they do not need to rely on a single market for income, thus exposing them to less risk. Conversely, New England mills may have an advantage selling EWP because they are more narrowly focused on developing markets specifically for EWP, in addition to having strong representation through the NeLMA trade association.

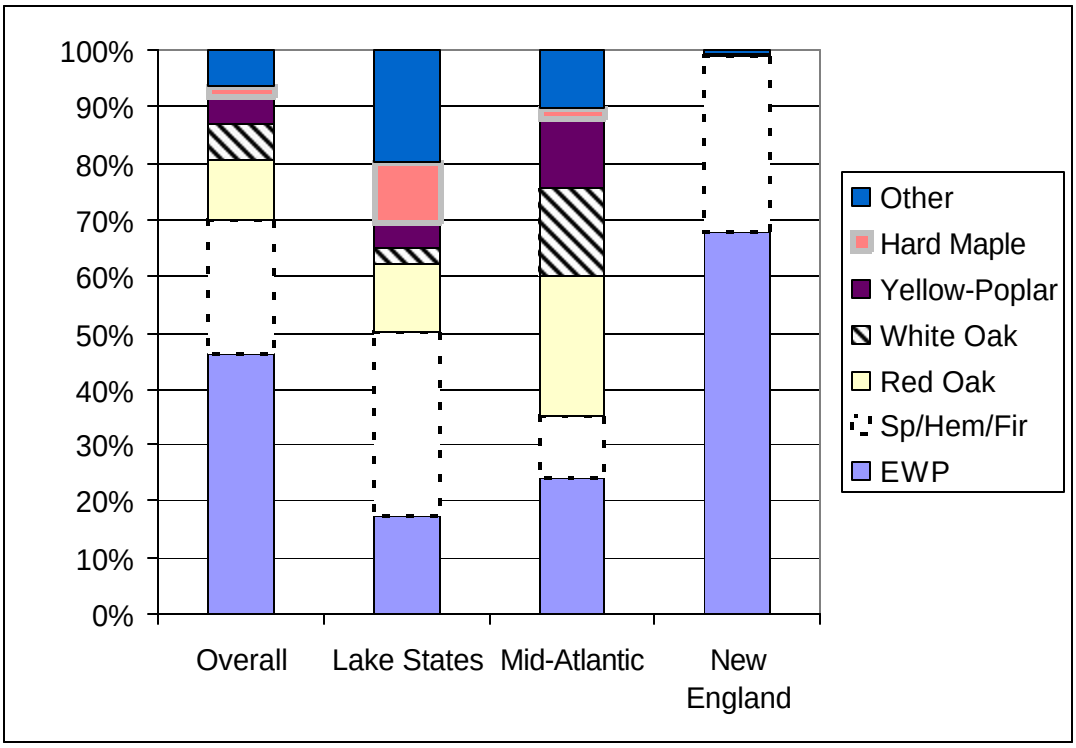

Figure 20. Typical species mix among primary manufacturers of EWP, overall and by region. "Other" consists of soft maple, ash, cherry, basswood, hickory, birch, beech, radiata pine, scots pine, and ponderosa pine.

It should also be noted that the New England and Lake State regions in Figure 20 show large quantities of "Sp/Hem/Fir" production. This suggests that the northern mills may incorporate more structural lumber into their mill production. Northern mills are much closer to large supplies of spruce and fir than the Mid-Atlantic region, which may be the cause for the increased use among EWP mills. This seems to be supported by the lower percentage of "Sp/Hem/Fir" in the Mid-Atlantic region in Figure 20.

The typical markets for EWP lumber in each region were estimated in a similar fashion as production size was in Figure 20. A question asking subjects to estimate the percentage of EWP production from their mill to various given secondary markets was asked. These percentages were then applied to previously calculated EWP production figures from each region, which yielded estimates of EWP lumber production directed

toward each of the given secondary markets. These estimates were then summed for each market, and divided by the total EWP production to get the data shown in Figure 21. It can be seen in Figure 21 how different the three markets are when it comes to who procures EWP. In New England, the retail market appears to get almost half of the total production. The retail market is present in the other two regions, but not nearly to the extent of the New England region. In the Lake and Mid-Atlantic regions, the log cabin/timber frame market seems to be the largest, with about 28% and 34% of the market, respectively. The window, door, and moulding segments are present in all three regions, but not to the extent that was previously thought.

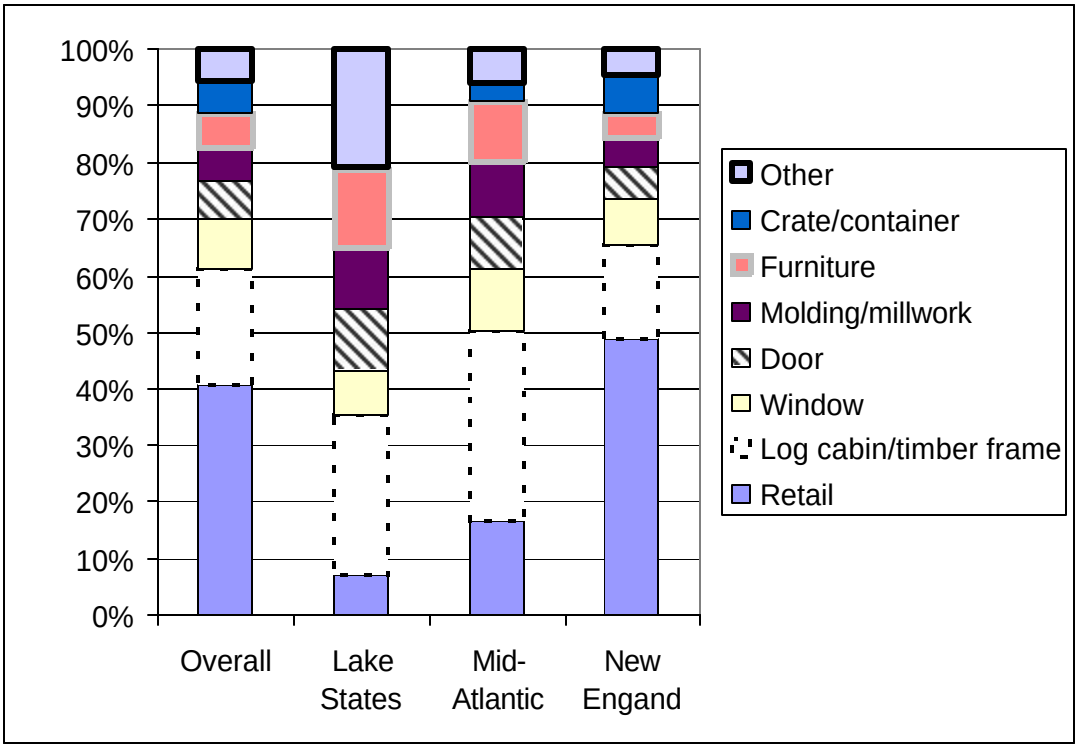

Figure 21. Typical EWP markets among primary manufacturers, overall and by region. "Other" consists of dimension, cabinet, flooring, casket, landscaping, and miscellaneous.

Regional Quality Comparison

The purpose of this research was to determine if there are perceived quality differences between the three regions producing EWP. To evaluate differences, a series of questions was included in the questionnaire to solicit opinions from primary manufacturers on regional EWP raw material quality. The first of these questions was related to the grading standards used in each region, because any discussion of quality has to begin with the metrics used to define quality. In the New England region, the most common lumber grading standards are maintained by NeLMA. Due to NeLMA's strong presence in this region, it is predicted that this region will use mostly NeLMA grades. Little was known about grading practices in the other regions, except that few use NeLMA grade rules. The results are illustrated in Figure 22.

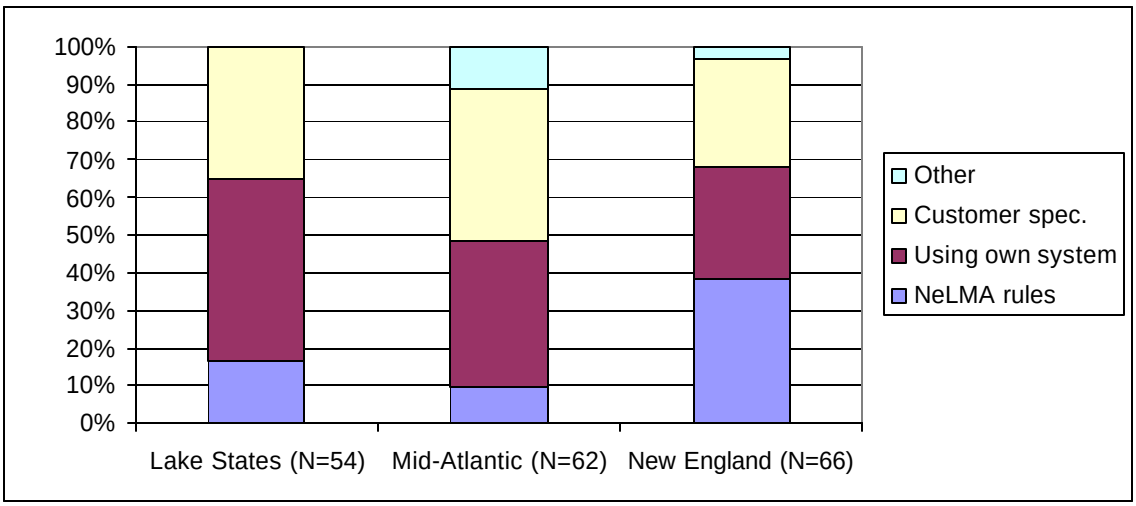

Figure 22. Grading rules utilized in the three regions.

As suspected, NeLMA grades were the most commonly used throughout the New England region, although not as dominant as previously thought with 38% of the market. All three regions show very high percentages of grading to customer specification and

using a proprietary system. The most common method in the Lake States was using a proprietary system, with 48%, while the largest in the Mid-Atlantic was grading to customer specification with 40%. It should be noted, however, that the 38% of the New England market using NeLMA grades is much larger in absolute terms than the higher usage rates in other markets due to the much larger size of the New England industry.

The questionnaire also asked about the availability of EWP raw material (logs). This question was included to address speculations that regional differences in availability may be a reason for competitive advantages in certain regions. The question asked respondents to state whether or not they experienced difficulty obtaining EWP raw material, and if so, to indicate what the cause of the difficulty was from a list of possibilities. Table 14 displays the results, while Figure 23 illustrates the responses given for difficulty in obtaining EWP logs when any existed.

Table 14 indicates that the amount of respondents having trouble obtaining EWP raw material is about half in each region. However, Figure 23 shows that this similarity does not always hold up when the reasons for the difficulty are compared across the three regions. The most obvious difference between the three regions was with weather, where New England mills apparently have significantly more difficulty harvesting trees due to inclement weather. This may be an opportunity for other regions to supply New England with logs during wet seasons, as the other regions reported very little trouble with weather. However, any effort to supply logs to other regions will be inhibited by shipping costs.

Table 14. Regional breakdown of mills experiencing difficulty obtaining EWP logs.

Is it difficult to obtain EWP logs?	Lake States (N=56)	Mid-Atlantic (N=61)	New England (N=67)
No	48%	52%	52%
Yes	52%	48%	48%

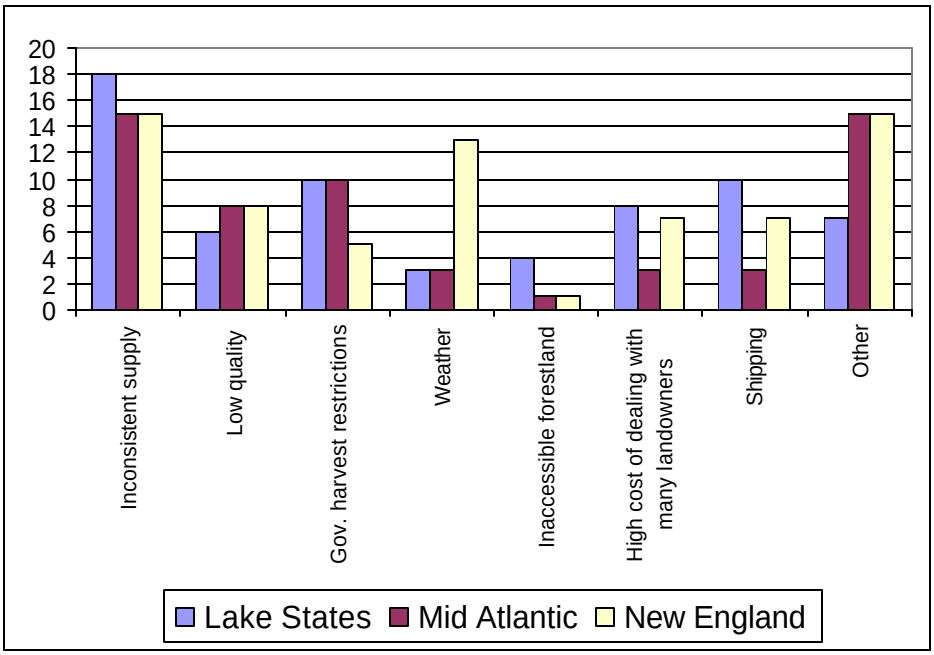

Figure 23. Frequency of responses for causes of difficulty obtaining EWP logs.

Inconsistent supply was mentioned the most by all three regions as a barrier to obtaining raw material, and "other" was the second most frequently mentioned, except in the Lake States. Upon examining the responses that were filled in for the "other" category, the most common answer was competition from Canada driving prices for EWP logs higher. This may create an opportunity for the Lake State region, who gave this response much less frequently, to supply the Mid-Atlantic and New England regions with EWP logs in times of short supply. A few of the other reasons given for difficulty

obtaining EWP was harvester shortage, insurance costs, competition for logs, and diseases killing or reducing quality of available raw material.

Certain regions purchasing raw material from other regions rather than their own has been identified as a possible cause for underutilization of EWP raw material. To address this issue, a question was included that asked respondents to estimate how much raw material they were procuring from each of the regions. Anecdotal evidence had predicted that Mid-Atlantic and Lake State regions may be procuring EWP logs from New England, presumably because the quality is perceived to be better. To calculate these results, the percentage of raw material each region bought from itself and each other region was compared to the total EWP production volume obtained later in the questionnaire. This yielded the absolute quantity purchased from each region, which was then divided by total production to produce the absolute percentage purchased from each region by each region. Results are shown below in Table 15.

Table 15. EWP raw material purchased from each region, by each region.

	EWP bought from this region		
EWP sold to this region	New England	Mid-Atlantic	Lake States
Lake States	1.9%	2.4%	99.8%
Mid-Atlantic	2.2%	95.1%	0.0%
New England	95.9%	2.5%	0.2%

Table 16. Mills reporting whether they do or do not buy EWP raw material from outside their region.

Response	Lake States	Mid-Atlantic	New England	Total
no	51	57	55	163
yes	3	5	10	18

Table 17. Reasons given for buying EWP raw material from other regions.

Reasons for buying EWP in other regions	Mills responding from each region			Total
	Lake States	Mid-Atlantic	New England	
Mill on border	1	2	7	10
Consistent supply	2	3	3	8
Higher quality	1	3	2	6
Lower prices	1	0	3	4
Easier buying	2	0	2	4
Other	0	1	0	1
Better selection	1	0	0	1
Wider logs	1	0	0	1
Better forest mgmt.	1	0	0	1
Less disease	0	0	0	0
Higher growth ring count	0	0	0	0
Larger distance btw. nodes	0	0	0	0
More attractive color	0	0	0	0

Table 15 clearly indicates that there is very little trade of raw material across regions, disproving earlier thoughts to the contrary. Furthermore, as is presented in Table 17, when any trading did take place between the regions, it was usually due to mills located on the border between two regions, and so any inter-region trade was coincidental.

Next, to compare opinions about EWP within the primary industries of the three regions, a question was included that asked respondents to rate the quality of EWP raw material grown in the three regions. The rating was on a Likert-type scale of 1 to 7, with 1 being low quality, 4 being average quality, and 7 being high quality. This data was then analyzed using an analysis of variance (ANOVA) to look for any regional differences in opinions about EWP quality in the three regions. The ANOVA was

performed at a = 0.05 significance level, using the Tukey's HSD post-hoc analysis to identify specific differences within the test groups. Results are presented in Table 18.

Table 18. Mean ratings of regional EWP lumber quality by the primary industry, by region.

Region Being Rated	N	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States	Mid-Atlantic	New England	
New England	98	5.03	4.94	5.00	5.07	0.92
Mid-Atlantic	92	4.59	4.36	4.81	4.21	0.15
Lake States	91	4.38	4.36	4.31	4.56	0.81

Table 18 indicates that the New England region was rated the highest overall in regional quality by primary manufacturers of EWP, followed by the Mid-Atlantic and Lake State regions. This relationship was also true for each individual region's separate ratings, except for New England which rated the Lake States higher than the Mid-Atlantic region with ratings of 4.56 and 4.21, respectively. No significant differences were found between the three regions using ANOVA, suggesting that the three regions helt similar views on the quality of EWP lumber being produced in each region.

To check the external validity of the results in Table 18, two extra questions were asked to probe further into the respondents' opinions about regional quality differences. The first asked respondents to state whether they felt there was any physical difference in EWP logs coming from the three regions. This question essentially targets the same factors surveyed in Table 18, but the approach is changed by asking respondents to check one of three boxes, stating either "Yes, there is a difference between the regions", "No, there is no difference", or "No opinion". The purpose of asking similar questions using a different approach is meant to test the external validity of the questionnaire, where similar results received by different methods prove that the questions are truly achieving

their objectives (i.e., the questionnaire results are valid). Since the previous results in Table 18 indicate that there are no significant differences between the three regions in their opinions about regional raw material quality, it is expected that a majority of respondents will now answer "No, there is no difference". Results are shown in Figure 24.

Figure 24 indicates that an overwhelming majority of respondents reported having no opinion, which received 60% of the total response. This lack of opinion is most likely due to the fact that few buyers procure EWP from other regions, as presented in Table 16. This idea is also supported by the open-ended responses solicited from this question, in which several respondents reported that they have no experience buying logs from other regions. The results in Table 18 appear to indicate that the majority of responses would be "no regional quality difference", but Figure 24 does not necessarily invalidate these results. Rather, having a large percentage of "no opinion" responses would logically lead to less distinct differences among the sample, which would be another valid cause for there being no significant differences in Table 18. A regional cross tabulation was also generated from this question's data. The results are shown in Table 19.

As presented in Table 19, the New England region held the strongest opinions regarding differences in EWP quality among the three regions. This is most likely due to the much stronger presence of EWP markets in that region, and the fact that many mills in that area rely solely on EWP production. Mills in other regions rely much more on other species, as is shown in Figure 20, and therefore have less interest vested in the reputation of their EWP. It is also possible that mills in New England believe that their EWP is truly superior, which is supported by the results in Table 18.

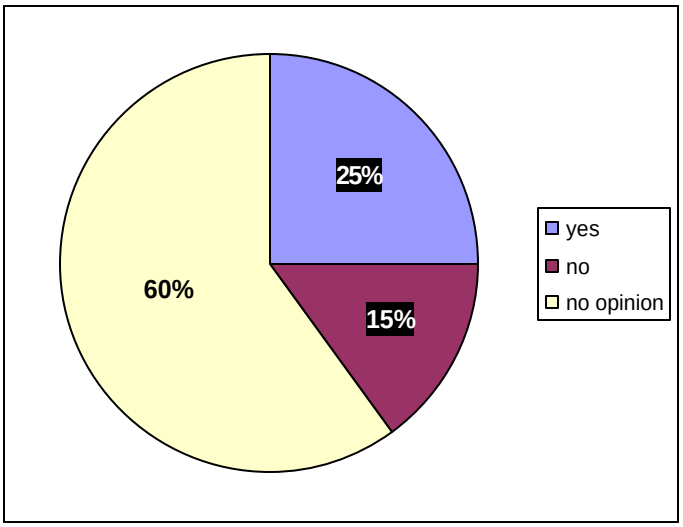

Figure 24. Industry-wide opinions on the presence of a difference in log quality coming from the three regions.

Table 19. Cross tabulation reporting opinions on the presence of physical differences among the three regions, by region sampled.

Region asked	Does a physical difference in EWP log quality exist between the three regions?			Total
	yes	no	no opinion	
Lake States	9	9	36	54
Mid-Atlantic	12	10	39	61
New England	24	8	33	65
Total	45	27	108	180

The second question used to validate responses on regional quality differences asked respondents to identify the US State in which they felt the highest quality EWP was produced. Again, it was predicted that the majority of respondents would name a New England State, which would validate earlier findings. Table 20 displays these results. As Table 20 presents, New England again was identified as having the most US States producing the highest quality EWP. The most frequent states mentioned were Maine (44), New Hampshire (17), North Carolina (10), New York (9), Vermont (8), and Wisconsin (8). It should be noted that many respondents may not have answered this

question because they had no knowledge of EWP in other regions, and therefore they had no opinion.

Table 20. Regional tally of responses for the US State producing the highest quality EWP raw material.

Region	Frequency	Percent
Lake States	21	17%
Mid-Atlantic	32	25%
New England	73	58%
Total	126	100%

Effect of Imported Species

One of the possible reasons for underutilization of EWP in the three regions being surveyed is pressure from imported species. During the past 10 to 15 years, imports such as radiata pine and scots pine have entered the US marketplace and disrupted traditional value chains for competing domestic species, such as EWP (Horgen and Maplesden, 1997). One of the objectives of this research was to assess the affect of these imported species on EWP markets, and to evaluate the characteristics that the primary industry perceives as important to customers buying these products.

The first step was to elicit industry opinions on whether the influx of imported species has had a positive or negative effect on their operation. The options given were, "Positive", "Negative", and "No effect". An open-ended area was left for respondents to elaborate on this opinion. The results are displayed in Table 21. As is presented in Table 21, the three regions answered in similar proportions in each category. Respondents reporting that imported species have had a negative effect on their operation outweighed those experiencing a positive effect by about 10 to 1 in all regions. This supports

previously stated predictions. However, a large majority of respondents in each region stated that imports were having no effect on their operation, implying that imported species such as radiata pine are not creating the widespread detrimental effects that were previously predicted. In fact, many respondents who filled out the open-ended response section stated that they had never heard of radiata pine. It is difficult to believe that mills producing EWP lumber could have never heard of the largest new competitor in their markets, but this is the case nonetheless.

Table 21. What effect have imported species such as radiata pine had on your operation?

		Response			
Region		positive	negative	no effect	Total
	Lake States	2	17	33	52
	Mid-Atlantic	1	23	35	59
	New England	4	30	27	61
Total		7	70	95	172

To probe further into the industry's opinions about imported species such as radiata pine, a series of questions was included in the questionnaire that ask respondents to rate certain characteristics of EWP that may give it an advantage over radiata pine among their customers buying the lumber. This was intended to identify the importance of certain EWP characteristics as perceived by the primary producer. Each question in the series asked respondents to rate the characteristics on a Likert-type scale of 1 to 7, with 1 being low importance, 4 being average importance, and 7 being high importance. This data was then compared using ANOVA at a = 0.05 significance level, and using Tukey's HSD post-hoc analysis to identify individual differences. Results are given in Table 22.

Table 22. Mean ratings on the importance of certain EWP product attributes to the primary industry, by region.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States (1)	Mid-Atlantic (2)	New England (3)	
Color	149	5.28	5.43	5.08	5.34	0.47
Machinability	156	5.22	5.02	5.11	5.49	0.22
Dimensional stability	151	4.94	5.11	4.69	5.04	0.39
Other	12	4.92	4.50	4.75	6.50	0.66
Supports local industry	153	4.89	4.89	5.06	4.73	0.68
Ordering	150	4.83	4.62	4.86	4.96	0.55
Fast delivery	148	4.79	4.31[2]	5.04[1]	4.96	**0.04***
Product range	150	4.77	4.75	4.49	5.06	0.14
Rustic look	153	4.61	4.83	4.45	4.57	0.56
Historical look	155	4.38	4.68	4.10	4.39	0.33
Low price	150	4.38	4.07	4.69	4.35	0.20
Paintability	150	4.35	4.16	4.24	4.61	0.34
Few defects	147	4.27	4.32	4.20	4.29	0.93
Durability	149	4.15	4.09	4.22	4.15	0.93
Strength	150	3.47	3.40	3.59	3.41	0.81

* Data in boldface type indicates the presence of a significant difference.
[1, 2] Represent significant differences between specific groups.

The results in Table 22 indicate that color was rated as the most important overall product attribute for EWP among primary manufacturers of EWP, followed by machinability and dimensional stability. All regions generally agreed on these attributes being among the highest. Conversely, strength was listed as the least important overall product attribute, followed by durability and having few defects. The only significant difference found between regions was with "Fast delivery", which the Mid-Atlantic region rated higher in importance than the Lake State region. This implies that sawmills in the Mid-Atlantic region place more effort on offering fast delivery than sawmills in the Lake States. No other inter-regional differences were found.

Eastern White Pine Promotion and Service Characteristics

In an effort to better understand which types of promotional efforts are used to market EWP, a question was included in the questionnaire addressing this issue. The question gave a list of promotional efforts to choose from, and respondents were asked to select which ones they participated in. Extra space was left blank for respondents to list promotion options not mentioned in the list. Results are as follows in Figure 25.

Categories in Figure 25 are ranked by total frequency of use when all regions are added together. The emphasis of customer service and lumber quality were the two most frequently used promotional activities. Adds in television and radio, as well as using brands and logos, were the least utilized promotional activities. As for regional comparisons, the New England region tended to use promotional activities more frequently than other regions across the board, except for having a webpage and maintaining a sales force, where the Mid-Atlantic region has a slight advantage. New England was particularly more active in certain promotional areas than either of the two other regions, including the use of the NeLMA logo, NeLMA membership, and placing adds in phone books and newspapers. This extra promotional effort is likely a contributing factor to the strength of New England's EWP markets.

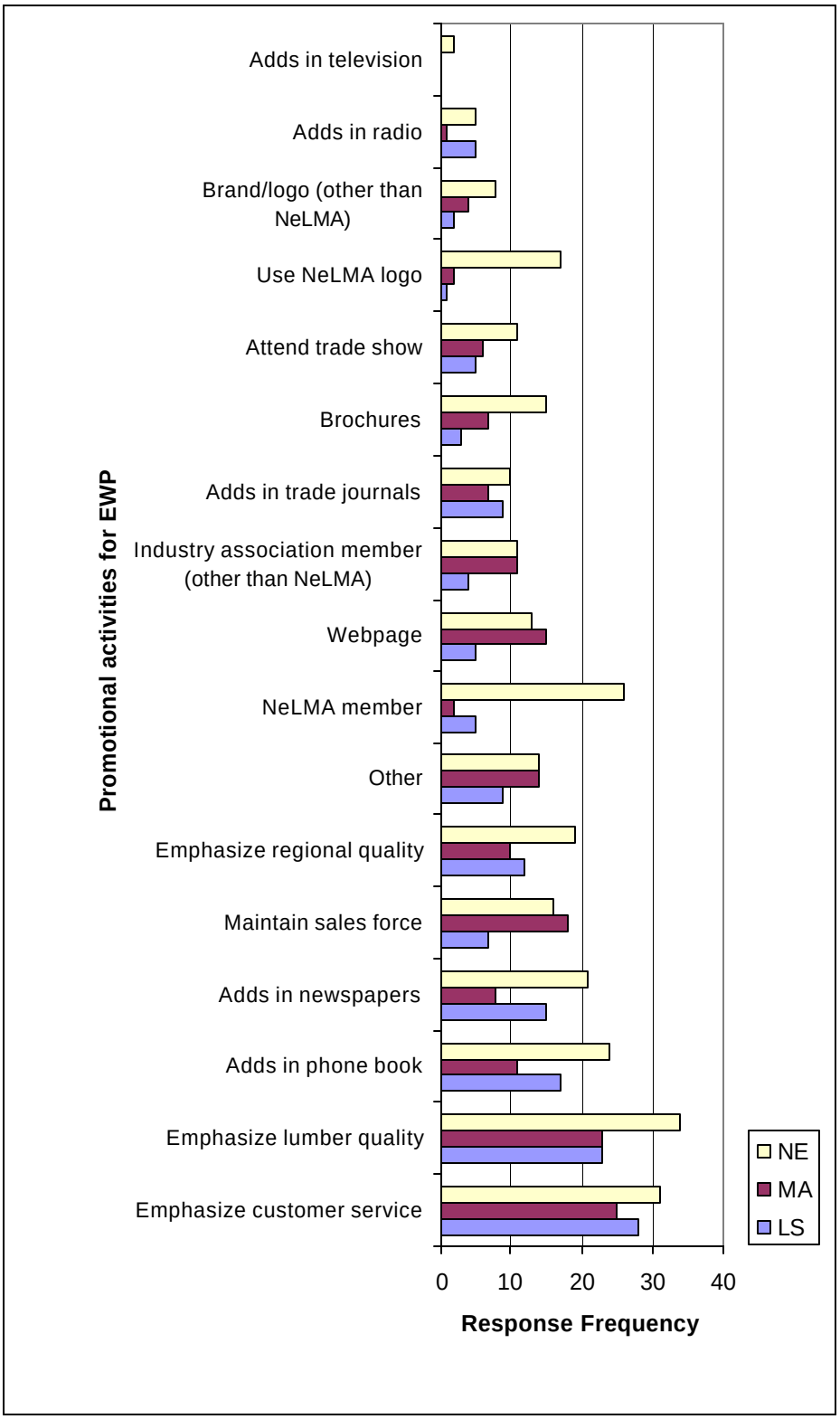

Figure 25. Utilization of promotion among primary EWP industry.

To further probe into the promotional activities undertaken by the primary EWP producing industry, a question was included that asked respondents to rate the amount of effort they put into providing services to their EWP customers. The purpose of this question was to identify where EWP mills are placing the majority of their sales efforts, both industry-wide and on a regional basis. Each question asked respondents to rate a series of service characteristics on a Likert-type scale of 1 to 7, with 1 being little effort, 4 being average effort, and 7 being high effort. This data was then compared using ANOVA at a = 0.05 significance level, and using Tukey's HSD post-hoc analysis to identify individual differences. Results are given in Table 23.

Table 23. Mean ratings on how much effort primary EWP manufacturers exert in providing certain service characteristics to their EWP customers, by market segment.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States	Mid-Atlantic	New England	
Good reputation	174	6.18	6.17	6.16	6.22	0.95
Understand customer needs	172	5.63	5.38	5.66	5.82	0.29
Special orders	172	5.62	5.81	5.72	5.37	0.23
Solving customer problems	173	5.60	5.55	5.65	5.59	0.93
On-time delivery	169	5.57	5.24	5.75	5.69	0.15
Available to customer	174	5.57	5.53	5.60	5.57	0.96
Strong business relationship	166	5.53	5.20	5.53	5.82	0.12
Consistent price	170	5.31	5.00	5.57	5.34	0.16
Product range	169	4.73	4.62	4.51	5.03	0.27
Knowledgable sales force	167	4.62	4.15	4.72	4.92	0.13
JIT delivery	166	4.19	4.10	4.36	4.12	0.70
Flexible payment	166	3.28	3.14	3.53	3.18	0.50

Table 23 indicates that having a good reputation rated as the service characteristic in which primary EWP manufacturers invest the most expense and effort to provide to their customers, and this characteristic was rated extremely higher than any other listed across all three regions {(Lake States (6.17), Mid-Atlantic (6.16), and New England

(6.22)}. This was followed by understanding customer needs and being able to handle special orders. The lowest rated service characteristic was offering flexible payment terms, followed by Just-In-Time delivery and having a knowledgable sales force. No significant differences existed between the three regions' efforts to provide any one service characteristic, which implies that the three regions generally agree on the ranking presented in Table 23. However, the extremely high rating given to having a good reputation provides a strong indication that primary manufacturers of EWP in all three regions believe that their success depends heavily on their reputation.

An additional characteristic that may lend a competitive advantage to a certain region is the adaptation of new technology. The questionnaire addressed this issue with a question that asked respondents to state how often they invested in new technology at their mill site by choosing from a list of given options. The options ranged from "More than 1 time a year", to "Less than 1 time every 10 years". It was thought that New England may have the highest rates of technology adoption of the three regions, which may be cause for their stronger EWP markets relative to the other regions. Results are displayed in Figure 26.

As can be seen in Figure 26, the prediction that New England would have the quickest rates of technology adoption of the three regions is supported by the results, but the difference is not large. The majority of mills from all regions invest in new technology every 1 to 3 years, with the next largest group being the less than 1 time every 10 years category. The Mid-Atlantic region was the second most innovative region, with the Lake States trailing behind as the least innovative. Overall, New England appears to have a slight advantage in technology investment, and so this may enable them to

produce better EWP products, but the difference between regions is not pronounced. It is interesting to note that Figure 26 essentially resembles a typical product life cycle progression, with a small group of innovators and early adaptors, followed by the early and late majority, and finally the laggards in the last category.

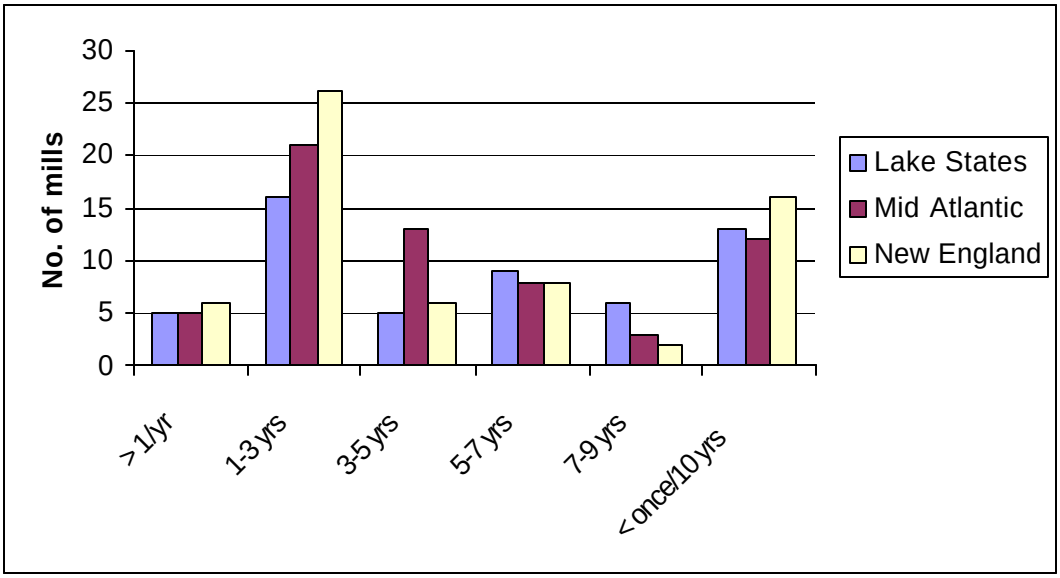

Figure 26. Frequency of technology investment, by region.

As an attempt to gauge each region's general approach to marketing EWP lumber, a final question was included in the questionnaire asking respondents to state whether or not they proactively search for new markets for EWP lumber. This question was intended to provide an insight into the three regions' overall opinions about selling EWP, and their enthusiasm in doing so. Results for this question are displayed in Figure 27.

As can be seen in Figure 27, only about 20% of respondents from each region reported that they proactively search for new markets for EWP products. This consistent response from the three regions suggests that despite differences in production volume and market strength in each region, those who produce EWP lumber in each region seem

to be equally satisfied with current business levels. This may leave an opportunity open for new entrants into the industry to satisfy any latent demand for EWP products that may be present, and Figure 27 suggests that competition for new business is equally low among all three regions.

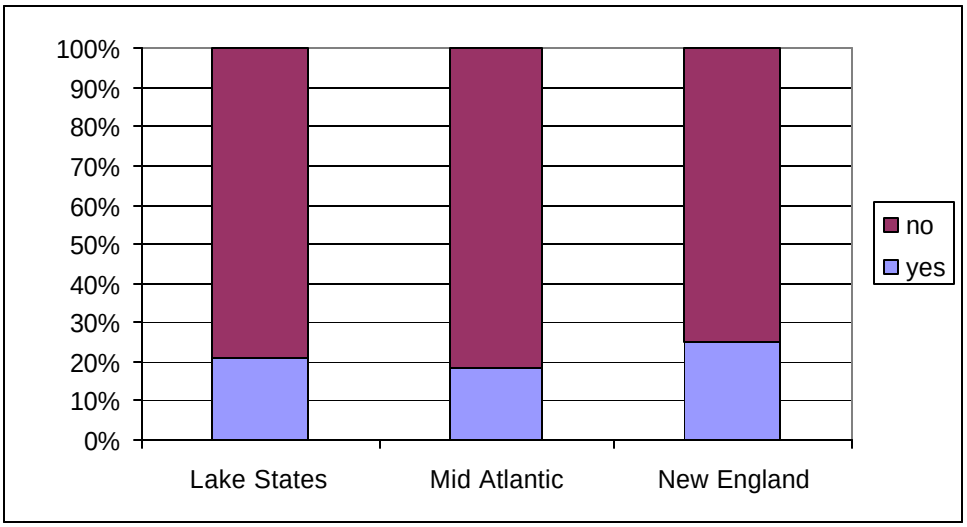

Figure 27. Percentage of companies stating whether or not they proactively search for new markets for EWP products.

The last question gave respondents a chance to voice their opinions about any topic related to EWP that may have been missed in the questionnaire. Many respondents claimed that they were running a small production mill, which may distort results. This was an astute comment to make, because production volume estimates presented at the beginning of this chapter were difficult to make due to the erratic nature of the data. This was unavoidable, though, and the opinions of small mills are as valuable as the large mills, and so should be included in the analysis. The mill size demographics are also included in this analysis. Other responses alluded to earlier complaints about competition for EWP logs from Canada. Although this competition may hurt both primary and

secondary producers, it is generally good for landowners and loggers. When demand is high, then prices will typically be high, providing more incentive to harvest EWP.

Conclusions

This research determined that primary producers of eastern white pine (EWP) plan to increase production during the next 5 years, growing by approximately 7.3% in the New England region, 4.5% in the Mid-Atlantic region, and 10.7% in the Lake State region. Species mix for EWP mills in New England is weighted heavily towards EWP production, while EWP mills in other regions rely on a broader species mix, primarily SPF and red oak. The major market for EWP lumber in New England is retail consumption, while log home and timber frame construction is the primary market for EWP in the other regions.

As for demographic characteristics of mills in the three regions, the majority of mills in Mid-Atlantic and Lake State regions have less than $1,000,000 in total annual sales, while New England mills are dispersed slightly more toward the $1 - 5 million to $5 - 15 range. The majority of mills in all three regions have less than 25 employees, and operate a single facility within their company. About half of the mills in each region stated that they had no problems procuring the EWP raw materials they required, while the other half claimed inconsistent supply and availability problems as the most frequent raw material supply problems. Contrary to previous predictions, the three regions do not engage in inter-regional trade of EWP raw materials to any significant degree.

When asked about the effects that imported species have had on their operations, the majority of primary EWP producers responded that it had no effect, while the majority of the remaining respondents replied that the effect was negative. When asked

to rate a series of products attributes regarding their importance to customers buying EWP versus competing imports such as radiata pine, the two most important attributes were color and machinability, while the least important were strength and durability. When comparing these attributes among regions, the only likely difference was that Mid-Atlantic mills tended to believe that delivery was more important to their customers than Lake States mills did.

Respondents in all three regions replied that emphasizing customer service and lumber quality were their most frequent promotional activities, and New England consistently pursued promotional activities more frequently than the other two regions. Respondents rated a good reputation, understanding customer needs, and handling special orders as the most important service characteristics to their customers, while flexible payment options, JIT delivery, and a knowledgeable sales force rated least important. Additionally, most mills in all regions stated that they invest in new technology once every 1 to 3 years, and about 20% of respondents from each region reported that they proactively search for new markets for their EWP products.

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Chapter 3: Regional Assessment of Secondary Markets for Eastern White Pine

Introduction

Eastern white pine (*Pinus strobus*) is a very significant species to the forest products industry in the eastern United States. It represents approximately 8.4% of the total volume of sawtimber on viable timberland, representing about 77.6 billion board feet of sawtimber (US Forest Service FIA Databank, 2003). With eastern white pine (EWP) representing such a large portion of eastern forests, there is a significant landowner interest in capturing more value from this material. Furthermore, EWP ranks 4th among species in its markets in overall board foot production along the Eastern US. This represents approximately 600 million board feet produced annually in eastern sawmills, which is more than either hard or soft maple, spruce/fir, cherry, ash, or hickory (alone, not combined) (US Census Bureau, 2003).

Despite the large quantities of EWP available in eastern forests, and its importance to the industry as a raw material, there has been speculation that EWP has not been capturing its potential value in many regions of the US for a number of reasons. First, it has been suggested that a growing disparity exists between the amount of EWP available in certain regions of the US and the amount being harvested in those regions. This disparity developed from the 1970's through the 1990's, and it now has begun to raise debate as to why certain regions are not making full use of their raw material (Irland, 1999 "Eastern White Pine"; Wiedenbeck, 2003). Some of the suggested reasons are quality differences, availability, production limitations, or competition from foreign species.

Aside from production issues, there is also a concern of high-value versus low-value products being produced from white pine roundwood. A general trend has been noted in the Mid-Atlantic and Lake States towards using white pine timber to produce more low-value products such as pulp stock, pallet cants, and OSB chips, whereas the New England area tends to produce more high-value lumber (Wiedenbeck, 2003). This has serious implications for landowners interested in selling timber in these regions. Further, finding higher-value markets for timber would not only serve individual landowners but also boost local economies by increasing the value of all white pine forestlands and allowing more profit to be made at each level of the distribution chain.

Another topic is the observation that sawmills in the Mid-Atlantic and Lake State regions are indeed sawing a significant amount of white pine, but they may be buying logs from the New England area (Wiedenbeck, 2003). Considering the ample local white pine supplies in these regions, one would immediately postulate that some type of quality difference exists between the regions. However, quality differences may be perceptual and not based on actual differences. Alternatively, white pine may be difficult to access in certain areas, or local supplies may not be consistent enough to depend on for continuous production. Whatever the reason, it is certain that many parties stand to benefit from the improved raw material utilization that would result from an increased understanding of these markets.

Finally, there is the issue of imported species and the pressure that they are placing on markets for domestic species. Radiata pine's rapid influx into the market has been well documented during the past 10 years, and its extremely competitive price has threatened those markets it has entered. Many of radiata pine's applications, such as

moulding, millwork, and other milled dimension parts, are shared with eastern white pine, making the two species direct competitors (Horgen and Maplesden, 1997; Harding et. al. 1999). Compounding the situation, New Zealand and Chile currently report huge growing volumes of radiata pine, which means that supplies to the US are likely to increase or at least hold steady for the next 10 years (Jélves et. al. 1989; Horgen and Maplesden, 1997). None of this implies that white pine is facing unavoidable decline, but it is clear that action must be taken to investigate market opportunities for white pine if eastern forests are to realize their full economic potential.

Research Objective

1. To assess and compare the secondary eastern white pine industry in the New England, Mid-Atlantic, and Lake State regions of the US.

Methodology

This research was conducted with a mail survey that utilized a questionnaire to gather information from secondary eastern white pine manufacturers on markets for eastern white pine (EWP). Once developed, this questionnaire was reviewed by the research committee, revised, and then pretested among industry representatives who were instructed to look for confusing or misleading questions, as well as suggest any topics that they felt to be important that may have been missed.

The population of interest to this study was EWP producers in three regions of the Eastern US: Lake States (IL, IN, MI, MN, OH, WI), Mid-Atlantic States (KY, MD, NY, MC, PA, TN, WV, VA), and New England States (CT, ME, MA, NH, RI, VT). The sample frame from each region was developed on a state-by-state basis by contacting local authorities in charge of tracking the forest products industry in each particular state

and requesting copies of industry directories. Directories that indicated species use were preferred but not always available.

Once pretesting was finished and the sample frame completed, the initial mailing was sent out to a total of 1,449 secondary manufacturers in April 2004. This first mailing was then followed by a follow-up postcard approximately three weeks later, a second questionnaire after another two weeks, and a second reminder postcard after another three weeks. Completed questionnaires were entered into the SPSS statistical software package, in conjunction with Microsoft Excel, for analysis. A copy of this questionnaire is included in the appendix (see Appendix 2).

As a test for non-response bias, 30 secondary manufacturers were contacted from the list of non-respondents. These non-respondents were asked to estimate their total annual EWP production and to rate four of the aspects listed in the original questionnaire. This data was compared to the data received from the questionnaire, looking for statistical differences between the two groups. The same comparisons were made between early and late respondents. Similarity between these groups would indicate that the results of the survey represent the whole population.

Results

A total of 1,449 questionnaires were sent to secondary manufacturers. The regional response rate is broken down in the following Table 24. In Table 24, the unadjusted response rate is the number of usable questionnaires returned divided by the total amount sent. The adjusted response rate was then calculated to account for bad addresses and questionnaires that were returned from mills that reported producing no eastern white pine (labeled "unusable questionnaires" in Table 24). The adjusted

response rate was calculated by dividing the amount of completed questionnaires by the new total number of questionnaires after subtracting the unusable questionnaires from the total sent.

Adjusted Response Rate = Completed Questionnaires / (Total Sent – Unusable)

Table 24. Regional breakdown of response rate.

	New England	Mid-Atlantic	Lake States	Total
Questionnaires sent	493	456	500	1449
Completed questionnaires returned	44	42	25	111
Unadjusted response rate	8.9%	9.2%	5.0%	7.7%
Unusable questionnaires	234	175	152	561
Adjusted response rate	17.0%	14.9%	7.2%	12.5%

The best response was received from the New England region, 17.0%. The Mid-Atlantic region was slightly lower but still satisfactory with 14.9%, but the Lake State region was at 7.2%. Extra measures were taken to try to boost the Lake State region response rate, such as calling mills that indicated that they are a secondary processor on a concurrent survey aimed at the primary EWP industry, but success was limited.

Non-Response Bias

Two types of non-response bias were tested for this data. The first compared the core survey data to a sample of 30 non-respondents who were contacted by phone after the completion of the data collection. These 30 non-respondents were asked four rating-style questions and asked to estimate their total annual EWP consumption. The two

product attributes with the highest and lowest overall ratings were selected from Table 44 ("supports local industry" and "rustic look", respectively), as well as the highest and lowest overall rated service characteristics from Table 45 ("consistent prices" and "flexible payment", respectively). The highest and lowest rated attributes were chosen from each question because it was believed that they would be the strongest detectors of bias. An ANOVA was performed on these questions and the production estimates at the $a = 0.05$ significance level. No differences were found between the two groups regarding rustic look, consistent prices, flexible payment, or production volume. However, a highly significant difference was found between the two groups regarding "supports local industry", with the original respondents rating this factor significantly higher than non-respondents (means: 5.30 vs. 4.07, respectively; p-value < 0.01). This may be an indication that supporting local industry may be a concern held more strongly by smaller-sized mills, as the original sample was skewed toward smaller mill sizes.

The second test compared answers from the first 30 respondents with the last 30 respondents, and the same analysis and questions were used for this comparison as with the first non-response test. No significant differences were found between early and late respondents regarding any of the test questions. Overall, there were few differences between the two groups regarding non-response bias, and this general concurrence among the strongest indicators of bias suggests that the results of the study can be reliably applied to the general population.

Respondent Demographics

A number of questions in the questionnaire asked respondents to identify certain demographical characteristics about themselves. This information allows for a more

detailed profile for mills in each region. By asking questions such as total sales, total employees, and number of mills owned by the company, it is possible to form a clearer picture of how mills in each region may differ.

The first such question asked respondents to estimate total gross sales at their specific mill location for the year 2003. Options given ranged from "Less than $1,000,000" to "Greater than $50,000,000. Table 25 presents these results.

Table 25. Total annual sales among secondary manufacturers of EWP.

	Mill tally by region		
Total Sales ($)	Lake States	Mid-Atlantic	New England
< 1 mil	12	16	30
1-5 mil	6	12	9
5-15 mil	2	7	3
15-25 mil	1	1	0
25-50 mil	0	0	0
> 50 mil	2	4	0

As Table 25 illustrates, the secondary EWP industry in the New England region is concentrated heavily toward the lower total sales categories, with the majority of respondents in the "less than $1 million" category, and no respondents grossing more than $15 million in annual sales. Lake State and Mid-Atlantic regions are more distributed across the earnings range. The plurality of mills in these regions was still in the "less than $1 million" category, but the total annual sales numbers did not drop off as sharply as they did in New England. Both Lake State and Mid-Atlantic regions had representation in the "$15-25 million" and the "greater than $50 million" categories. This high concentration of small secondary mills may be a disadvantage for primary processors in New England because it limits the amount of product that can be sold to any one customer. However, having many smaller customers in many different secondary markets reduces your dependence on any one customer, thus reducing risk.

Another demographic question asked respondents to select their job title from a list of options. Table 26 lists the options that were given, and the frequency of respondents holding each job title.

Table 26. Titles of respondents filling out questionnaire.

	Mill tally by region		
Total Sales ($)	Lake States (N=24)	Mid Atlantic (N=41)	New England (N=45)
President	38%	32%	42%
Vice Pres	13%	5%	2%
Owner	33%	34%	42%
Manager	13%	22%	7%
Sales	0%	0%	0%
Other	4%	7%	7%
Total	100%	100%	100%

Table 26 shows that the majority of respondents in all three regions held either the title of "President" or "Owner". There were also a significant number of "Managers" responding, with few "Vice President" or "Other" respondents, and no "Sales" respondents. Most of the "Other" respondents were either Purchasers or other titles for more specific management positions (i.e., plant manager, COO).

Respondents were also asked to state how many employees they have at their location by selecting from a given list of ranges. Results are presented in Table 27.

Table 27. Number of employees at respondents' mill, by region.

	Mill tally by region		
No. of Employees	Lake States	Mid-Atlantic	New England
< 25	18	24	37
25-50	4	9	4
51-100	0	3	2
101-200	0	3	0
201-300	0	0	0
301-400	0	1	0
> 400	1	0	0

As is shown in Table 27, all three regions were heavily leaning toward secondary industry mills with less than 25 employees. New England and Lake State region mills were particularly concentrated in the "less than 25 employees" category. The Mid-Atlantic region shows a slight tendency toward larger mill employment numbers, which agrees with results of Table 25 which shows that Mid-Atlantic mills responding to this survey tended to have higher total annual sales than the other two regions. Interestingly, the Lake State region was the only one to have a secondary mill with more than 400 employees.

A final demographical question was asked to ascertain the number of mills operating single and multiple operations. Results are presented in Table 28.

Table 28. Company operates a single vs. multiple facilities.

	Mill tally by region		
No. of facilities	Lake States	Mid-Atlantic	New England
Single	19	33	42
Multiple	5	8	2

Table 28 indicates that the vast majority of mills in all regions are operating from a single facility. The Mid-Atlantic region had the most multiple facility operations, which again agrees with results from Table 27 and Table 25, indicating that secondary mills in the Mid-Atlantic region have more mills in higher categories of total annual sales and total employment. These demographical results suggest that secondary manufacturers of EWP in the Mid-Atlantic region are generally larger in size, though this does not imply that the total market size is larger. However, it does imply that the secondary EWP market is healthy enough to sustain a number of large players.

Secondary Eastern White Pine Market Characteristics

An attempt was made to estimate average annual eastern white pine (EWP) consumption at secondary mills in the three regions. Due to a few very large mills in each region, a simple average of mill consumption among respondents was skewed towards higher production estimates. To counter this effect, outliers were identified as those outside 3 standard deviations of the original mean. A new mean and median were then calculated excluding those outliers. As presented in Table 29, there is still a relatively large gap between the mean and median estimates of average production. Based on the sample frame, it would be reasonable to report that the average mill sizes calculated excluding outliers in Table 29 is a reflection of the quantity of EWP being consumed in each region, while the median mill size represents the most common size for a secondary EWP operation in that area.

Table 29. Average EWP mill consumption among secondary manufacturers, by region.

	N	All Data Included (bdft)		Excluding outliers past 3 St. Dev. of original mean (bdft)	
		Mean	St. Dev.	Mean	Median
NE	39	274,760	903,036	155,674	3,500
MA	38	864,860	1,626,868	565,685	75,000
LS	21	244,517	501,330	166,118	22,000
Total	98	497,093	1,211,413	330,686	13,500

Table 29 shows that an average secondary manufacturer of EWP in the Mid-Atlantic (MA) region consumes close to 566,000 bdft, while those in New England (NE) use about 156,000 bdft annually and those in the Lake State (LS) region consumed about 166,000. These results imply that the Mid-Atlantic region has a high concentration of larger-sized secondary mills. It was believed that New England would likely have the

largest users of EWP located in their region due to the traditional strength of EWP markets in that area. Table 29 does not support this hypothesis. Additionally, it should be noted that this distribution was skewed towards smaller manufacturers and a few very large manufacturers made this mean value larger than was reported by most respondents.

To estimate general trends in market size, respondents were asked to predict whether they plan to increase, decrease, or remain constant in their EWP lumber production volumes during the next 5 years, and to estimate the percent change. This data was compared to responses for total EWP lumber production to generate an estimate of absolute change in EWP production. For example, if the respondent answered that they produce 1 MMbf of EWP, and they plan to increase production by 20%, then the net change would be an increase of 200,000 bf. All of these net change values were summed and then divided by the sum of EWP lumber production within the sample to give an estimation of absolute market size change during the next 5 years. Estimates of percent change are based solely on data received from respondents. Table 30 summarizes these results.

Table 30. Predicted growth trends for EWP in secondary markets, next 5 years.

	Region		
	New England	Mid-Atlantic	Lake States
Total produced (bdft)	10,715,630	32,864,670	5,134,850
Net change (bdft)	551,960	8,419,050	518,365
Percent change	5.2%	25.6%	10.1%

Table 30 presents the most significant growth in secondary markets for EWP during the next 5 years will occur in the Mid-Atlantic region, with a 25.6% predicted growth rate. This prediction contrasts greatly with the New England region, which is predicted to increase secondary demand by 5.2% during the next 5 years. The Lake State

region is estimated to grow by approximately 10.1% in this same time period, which is still a significant rate of growth. The high predicted growth rate for the Mid-Atlantic and Lake State regions means that there should be opportunities for primary EWP producers in those regions to satisfy that growing demand. This is an advantage for mills already located in the regions where growth is occurring, but it also presents opportunities for mills in other regions to capture a part of the growing market.

An attempt was made to characterize the typical secondary EWP mill by species produced. This was done to discern trends among the three regions concerning how EWP is produced, and how it fits into their product mix. This characterization was produced using a question that asked subjects to estimate the percentage of various species that they produce from a given list. These percentages were then converted to actual figures based on their earlier estimate of total production. The total production for each species was then calculated, and divided by total production for all species on a regional basis. Figure 28 provides results for the entire primary EWP industry, and by region.

Figure 28 indicates that secondary EWP mills in New England and Mid-Atlantic regions depend on EWP for the majority of their production, while secondary Lake State mills use it for less than 7% of their total production. Mills in the Lake States sawing EWP used primarily hard maple, red oak, cherry, and "other" species such as western white pine and douglas-fir for the majority of their production. These results suggest that the secondary EWP industry in the Lake State region is likely to be comprised of several smaller EWP consumers rather than a concentrated group of large volume consumers. Secondary mills in all three regions used surprisingly little radiata pine, with Lake State

and New England regions using it for less than 1% of total production, and the Mid-Atlantic using it for 13%. This implies that while radiata pine still poses a threat to EWP markets, it has not yet captured the amount of market share that was previously predicted.

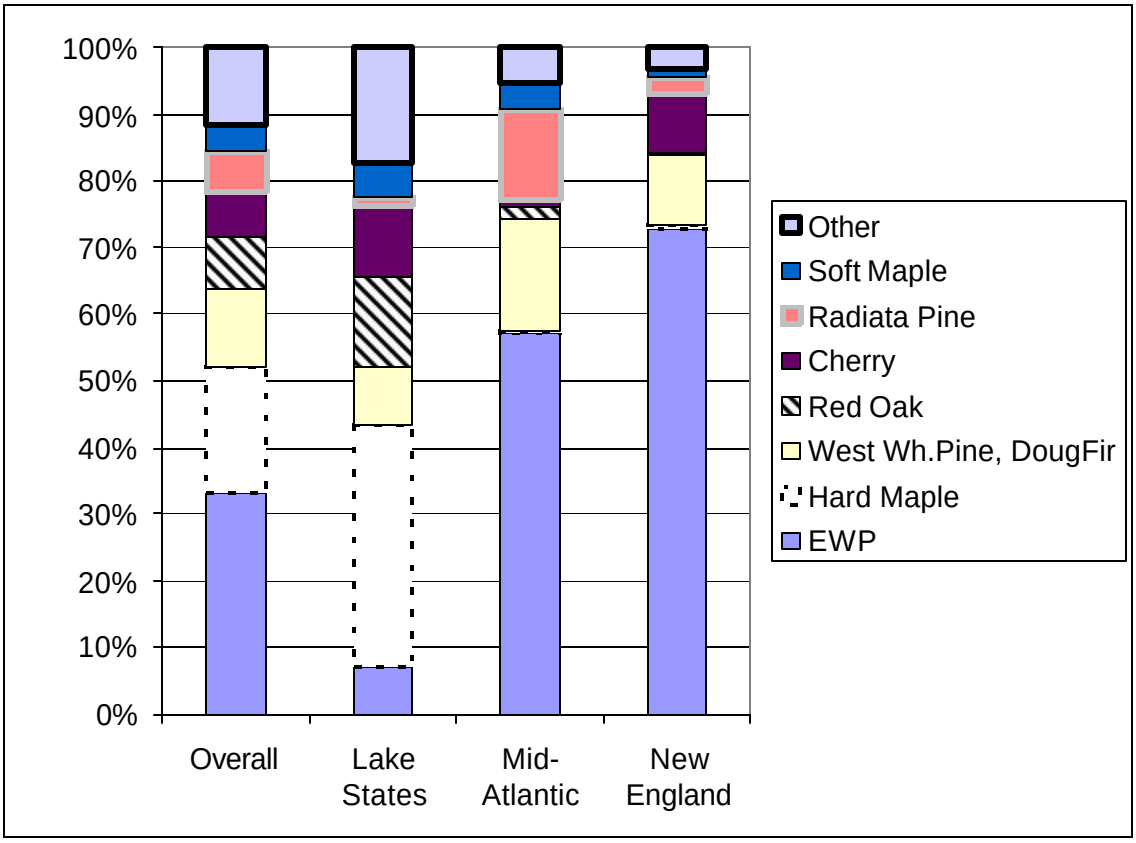

Figure 28. Typical species mix among secondary manufacturers, overall and by region. "Other" species included hickory, yellow-poplar, white oak, ponderosa pine, birch, ash, mahogany, scotts pine, basswood, and beech.

Respondents were asked to indicate the type of secondary operation they run by selecting from a list of given alternatives. This information was needed to better characterize the respondents to the survey and to identify any industries that may have replied in particularly high or low numbers as compared to others. This information was also used to make comparisons between the individual secondary industries, which

appears toward the end of this chapter. Table 31 below presents regional responses from each industry.

Table 31. Respondents from each secondary industry, by region.

Secondary Industry	Lake States	Mid-Atlantic	New England	Total
Other	3	8	12	23
Moulding/millwork	7	9	6	22
Log home/timberframe	4	12	4	20
Furniture	3	2	14	19
Window	1	2	2	5
Retail	3	2	0	5
Cabinets	1	1	3	5
Dimension	0	4	0	4
Crate/container	1	0	3	4
Door	1	1	1	3
Flooring	1	0	0	1
Landscaping	0	0	0	0
Burial casket mfg.	0	0	0	0
Total	25	41	45	111

As is presented in Table 31, the bulk of the responses came from the categories "Other", "Moulding/millwork", "Log home/timber frame", and "Furniture". The majority of "Other" responses came from New England, and the most common responses for this category across all three regions were crafts such as wood turnings, carvings, and toys. The number of "Moulding/millwork" respondents was similar across the three regions, while the majority of "Log home/timber frame" came from the Mid-Atlantic region. The majority of furniture responses came from the New England region. It should also be noted that the Log home/Timberframe industry is not completely secondary in nature, as it often uses whole logs that are not sawn but formed into round dimensions. However, the majority of log homes are made from a profiled siding-type product that has been sawn out of the log, which makes them traditional secondary

products. In addition, the Log home/Timberframe market was also classified as a secondary industry to distinguish it from sawmills, and to allow the primary analysis to focus solely on sawmills. This difference will be acknowledged in the analysis that follows by performing certain statistical tests with and without the Log home/ Timberframe respondents included.

Regional Quality Comparison

Certain regions purchasing raw material from other regions has been identified as a possible cause for underutilization of EWP raw material. To address this issue, a question was included asking respondents to estimate how much raw material they were buying from each of the regions. Anecdotal evidence indicated that Mid-Atlantic and Lake State regions may be buying EWP lumber and other sawn products from New England, presumably because the quality is perceived to be better.

To quantify the amount of material exchanged between regions, the percentage of EWP raw material each region bought from itself and every other region was compared to the total EWP production volume obtained later in the questionnaire. This yielded the absolute amount of EWP purchased from each region in board feet, which was then divided by total production to produce the absolute percentage purchased from each region by each region. Results are given in Table 32.

Table 32. EWP raw material purchased from each region, by each region.

	EWP sold to this region		
EWP bought from this region	New England	Mid-Atlantic	Lake States
Lake States	0.1%	6.7%	83.1%
Mid-Atlantic	0.0%	67.2%	5.3%
New England	99.9%	26.1%	11.5%

Table 32 indicates that although secondary processors of EWP in New England buy raw material exclusively from primary producers in New England, there is some regional trade of sawn EWP products among regions. The Mid-Atlantic region is buying 26.1% of its sawn EWP from New England and 6.7% from the Lake States, while the Lake State region is buying 11.5% of its sawn EWP from New England and 5.3% from the Mid-Atlantic. This suggests that the New England region is the area of choice for those in the Mid-Atlantic and Lake States who want to buy from outside their own region. It also implies that there may be an opportunity for primary EWP producers in Mid-Atlantic and Lake State regions to use their proximity to secondary markets in their own regions to capture market share currently held by New England mills.

To follow up on the results from Table 32, respondents were asked to state whether or not they buy EWP raw material from other regions, and then were presented with a list of possible situations causing them to by-pass local EWP supplies to buy sawn products from outside their regions. Results are presented in Table 33 and Table 34.

Table 33. Mills reporting whether they do or do not buy EWP raw material from outside their region.

Response	Lake States	Mid-Atlantic	New England	Total
no	16	25	39	80
yes	8	16	2	26

Table 33 indicates that a significant number of secondary EWP processors in the Mid-Atlantic region are buying raw material from other regions. About half of Lake State mills are buying from other regions, while very few New England mills buy from other regions. These results validate the findings in Table 32, which suggested a similar trend in total board feet exchanged inter-regionally.

Table 34. Reasons given for buying EWP raw material from other regions.

Reasons for buying EWP in other regions	Mills responding from each region			Total
	Lake States	Mid-Atlantic	New England	
Consistent supply	2	7	2	11
Higher quality	2	6	1	9
Other	3	5	1	9
Lower prices	2	4	1	7
Better selection	1	4	0	5
Easier buying	0	3	0	3
Mill on border	0	1	0	1
Wider logs	0	1	0	1
Better forest mgmt.	0	0	0	0
Less disease	0	0	0	0
Higher growth ring count	0	0	0	0
Larger distance btw. nodes	0	0	0	0
More attractive color	0	0	0	0

As is shown in Table 34, consistent supply was the most cited reason for buying EWP from other regions, followed by quality concerns. This was particularly true in the Mid-Atlantic region, where most of the inter-regional trade is occurring (see Table 32). The "Other" category was also frequently cited, and most answers filled in for this cited "availability" issues, which can be considered similar to "Consistent supply". This places "Consistent supply" even higher as the top reason secondary EWP processors buy from other regions. Another interesting result was that few respondents cited proximity to another region as a cause for buying from other regions, which suggests that the inter-regional trade of EWP sawn products is intentional and not simply the result of mills being located close to a regional border.

Next, to compare opinions about EWP within the secondary industries of the three regions, a question was included that asked respondents to rate the quality of EWP raw material grown in the three regions. The rating was on a Likert-type scale of 1 to 7, with 1 being low quality, 4 being average quality, and 7 being high quality. This data was

then analyzed using an analysis of variance (ANOVA) to test for any regional differences in opinions about EWP quality in the three regions. The ANOVA was performed at a = 0.05 significance level, using the Tukey's HSD post-hoc analysis to identify specific differences within the test groups. Results are presented in Table 35.

Table 35. Mean ratings of regional EWP lumber quality by the secondary industry, by region.

Region Being Rated	N¤	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States (1)	Mid-Atlantic (2)	New England (3)	
New England	68	5.29	5.07	5.13	5.52	0.44
Lake States	47	4.60	4.91	4.31	4.33	0.35
Mid-Atlantic	57	4.53	4.00 [2]	4.82 [1]	4.25	**0.05 ***

¤ Total number of respondents (from all regions) who gave a rating for specified region.
* Represents a significant difference within the group at the a = 0.05 level.
[1, 2] Represent significant differences between specific groups.

Table 35 indicates that secondary EWP producers in the Mid-Atlantic region perceive the quality of EWP lumber produced in the Mid-Atlantic to be higher than in the Lake State region. Other than this difference, the three regions agreed on the quality of EWP lumber being produced in each region. Overall, EWP lumber produced in New England had the highest average rating, averaging 5.29 across all regions. The Lake State and Mid-Atlantic regions were relatively similar, with ratings of 4.60 and 4.53, respectively. This analysis was also performed excluding the Log home/Timberframe respondents, and this analysis revealed no significant differences.

Two extra questions were asked to probe further into the respondents' opinions about regional quality differences. The first asked respondents to state whether they believed there was any physical difference in EWP lumber coming from the three regions. This question essentially targets the same factors surveyed in Table 32 through

Table 35, but the approach is changed by asking respondents to check one of three boxes, stating either "Yes, there is a difference between the regions", "No, there is no difference", or "No opinion". The technique of asking different questions that target similar information is used to provide internal validity to the questionnaire. Since the results in Table 33 present a majority of respondents buying EWP only from within their region, the finding a large amount of "No opinion" or "No, there is no difference" responses will suggest that the data is valid. Results are given in Figure 29.

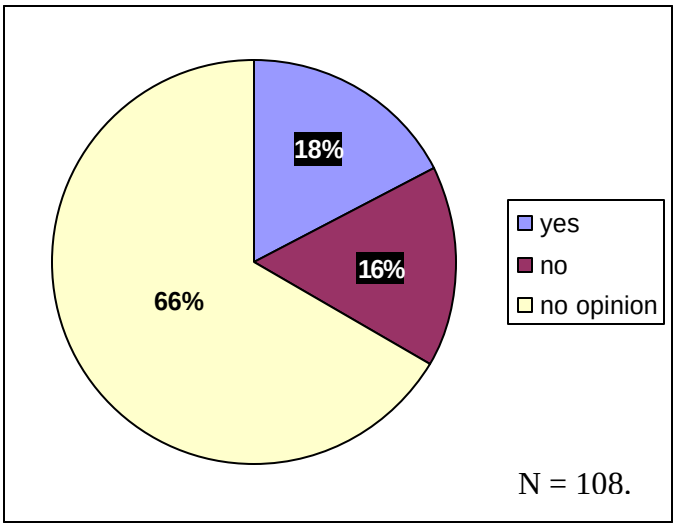

Figure 29. Industry-wide opinions on the presence of a difference in lumber quality coming from the three regions.

Figure 29 illustrates that an overwhelming majority of secondary EWP producers have no opinion about the quality of EWP produced in other regions, which supports the findings from Table 33 indicating that the majority of secondary EWP producers do not buy raw material from outside their region. The relatively small percentage of respondents reporting a difference in quality between the three regions (18%) considered together with the relatively large quantities of raw material being traded between the

regions (Table 32) indicates that a large portion of inter-regional trade is being generated by a relatively small group of secondary processors.

A regional cross tabulation was also produced from this data. Results are provided in Table 36.

Table 36. Cross tabulation reporting opinions on the presence of physical differences among the three regions, by region sampled.

	Lake States	Mid-Atlantic	New England	Total
Yes	6	8	5	19
No	7	8	2	17
No opinion	11	25	36	72
Total	24	41	43	108

Table 36 indicates that there is not a large difference in opinion on the presence of physical differences in EWP raw material produced in the three regions among secondary EWP producers across all three regions. The results in Table 32 suggest that the Mid-Atlantic region should report the presence of quality differences more frequently due to the large percentage of EWP it buys from other regions. This is supported by the results presented in Table 36, but very weakly, with 8 respondents in the Mid-Atlantic stating that physical differences exist compared to 6 and 5 in the Lake States and New England, respectively.

The second question used to validate responses on regional quality differences asked respondents to identify the US State in which they believed the highest quality EWP was produced. The results presented include all regions together. Given previous results, it is predicted that the majority of respondents will name a New England State, which would validate earlier findings. Table 37 displays these results.

Table 37. Regional tally of responses for the US State producing the highest quality EWP raw material.

Region	Frequency	Percent
Lake States	13	17%
Mid-Atlantic	18	23%
New England	46	60%
Total	77	100%

Results in Table 37 indicate that New England was identified by secondary EWP producers as having the most US States producing the highest quality EWP raw material. The most frequently mentioned individual States were Maine (22), New York (10), Vermont (10), New Hampshire (8), and Michigan (6).

Effect of Imported Species

One of the possible reasons for underutilization of EWP in the three regions being surveyed is pressure from imported species. During the past 10 to 15 years, imports such as radiata pine and scotts pine have entered the US marketplace and disrupted traditional value chains for competing domestic species, such as EWP (Horgen and Maplesden, 1997). One of the objectives of this research was to assess the impact of these imported species on EWP markets, and to evaluate the characteristics that the secondary industry perceives as important when buying these products.

The first step was to elicit industry opinions on whether the influx of imported species has had a positive or negative effect on their operation. The options given were, "Positive", "Negative", and "No effect". An open-ended area was left for respondents to elaborate on this opinion. The results are displayed in Table 38.

Table 38. What effect have imported species such as radiata pine had on your operation?

Region		Response			Total
		positive	negative	no effect	
	Lake States	1	6	15	22
	Mid-Atlantic	4	9	25	38
	New England	2	5	32	39
Total		7	20	72	99

As presented in Table 38, the majority of secondary EWP producers in each region stated that imported species have had no impact on their operation. Imported species such as radiata pine and scots pine were believed to have had a much larger presence in secondary EWP markets than these results indicate. Additionally, many people who completed the open-ended response section of this question stated that they had never even heard of radiata pine. This does not mean that radiata pine does not pose a threat to EWP markets, but as of yet large market changes towards imported species do not seem to have taken place.

Furthermore, respondents within the secondary EWP producing industry reporting that imported species have had a negative effect on their operation far outweighed those reporting a positive effect in all three regions. This was particularly surprising because secondary processors are exactly the group that should benefit from price competition brought on by cheaper imports. Most of the open-ended responses given by those reporting a negative effect had to do with price erosion leading to general industry decline and the closing of local production operations, both primary and secondary. This is a very interesting response, because it implies that secondary producers generally perceive that the fate of their business is linked to the fate of the domestic primary industry, and that cheaper raw material prices due to imports is not necessarily good.

To probe further into the industry's opinions about imported species such as radiata pine, a series of questions was included that ask respondents to rate certain characteristics of radiata pine that may give it an advantage over EWP when making raw material purchasing decisions. Advantages of all varieties were considered, whether they were material attributes or service characteristics. This was intended to identify the reasons why secondary EWP producers may prefer to use radiata pine. Each question in the series asked respondents to rate the characteristics on a Likert-type scale of 1 to 7, with 1 being low importance, 4 being average importance, and 7 being high importance. This data was then compared using ANOVA at a = 0.05 significance level, and using Tukey's HSD post-hoc analysis to identify individual differences. Results for this analysis are given in Table 39.

Table 39. Mean ratings for the importance of certain characteristics of radiata pine that facilitate its use instead of EWP.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States (1)	Mid-Atlantic (2)	New England (3)	
Price	63	4.76	5.14	4.77	4.44	0.32
Few defects	62	4.27	4.92	4.26	3.83	0.08
Other	26	4.23	5.00 [3]	5.00 [3]	4.00 [1, 2]	**0.02 ***
Strength	62	4.18	4.46	4.10	4.11	0.50
Paintability	62	3.89	4.38	3.81	3.67	0.10
Delivery	63	3.73	4.38 [2]	3.41 [1]	3.83	**0.01 ***
Machinability	62	3.69	4.15	3.71	3.33	0.09
Ordering	63	3.65	4.46 [2]	3.38 [1]	3.56	**0.01 ***
Stability	62	3.53	3.77	3.29	3.78	0.21

* Represents a significant difference within the group at the a = 0.05 level.

[1, 2, 3] Represent significant differences between specific groups.

The overall mean ratings across the secondary EWP industry given in Table 39 show that Price was the highest-rated factor giving radiata pine an advantage over EWP. Price was followed by having fewer defects and then by the "Other" category, for which

respondents gave no further explanation when asked to specify. As for regional comparisons, both Delivery and Ordering were rated as being less of a disadvantage for radiata pine in the Lake States than in the Mid-Atlantic region. This implies that primary producers of EWP may be able to compete better with radiata pine by improving delivery and ordering processes more effectively in the Mid-Atlantic region than in the Lake State region. The "Other" category rated as being less of a disadvantage for radiata pine in the Lake State and Mid-Atlantic regions than in the New England region, but since no explanation was given by respondents as to what this other characteristic might be, this result carries little implication.

This analysis was also performed excluding Log home/Timberframe manufacturers. The result of this test showed that delivery, ordering, and "other" categories resulted in the same significant differences. Additionally, the Lake States rated paintability as statistically more important in their decision to purchase radiata pine than New England respondents. This suggests that paintability is more important to traditional secondary EWP manufacturers than to Log home/Timberframe manufacturers ($p = 0.05$).

After finding the main advantages that the secondary industry attributes to radiata pine, the alternate question was included asking respondents to rate certain factors of EWP that they perceive give it an advantage over imported species such as radiata pine. Each question in the series asked respondents to rate the characteristics on a Likert-type scale of 1 to 7, with 1 being low importance, 4 being average importance, and 7 being high importance. This data was then compared using ANOVA at $a = 0.05$ significance

level, and using Tukey's HSD post-hoc analysis to identify individual differences. Results for this analysis are given in Table 40.

Table 40. Mean ratings on the importance of certain EWP product attributes to the secondary industry, by region.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States (1)	Mid-Atlantic (2)	New England (3)	
Supports local industry	83	5.30	4.95	5.03	5.86	0.15
Ordering	84	5.24	4.57	5.32	5.62	0.10
Fast delivery	81	5.17	4.62	5.47	5.23	0.25
Color	77	4.96	5.14	4.71	5.12	0.63
Low price	80	4.75	4.71	5.00	4.48	0.59
Few defects	80	4.70	4.48	4.41	5.22	0.25
Dimensional Stability	78	4.68	4.81	4.50	4.78	0.81
Machinability	77	4.53	4.05	4.42	5.08	0.20
Product range	76	4.32	4.86	4.32	3.83	0.20
Paintability	76	4.14	3.85	3.97	4.60	0.37
Historical look	79	4.13	4.43	3.37	4.71	0.06
Durability	77	4.09	4.25	3.87	4.23	0.72
Strength	79	3.89	3.86	3.69	4.15	0.62
Rustic look	79	3.86	4.29	3.94	3.44	0.48
Other	10	3.50	2.50	3.00	6.50	0.24

Table 40 illustrates that the most important factor to secondary producers buying EWP is that it supports local industry, followed by easier ordering and faster delivery. This result is the opposite of those in Table 39, which indicate that ordering and delivery were not advantages of radiata pine. This suggests that producers of EWP lumber would benefit most from emphasizing the local origin of their product and by offering preferable ordering and delivery terms. The least important characteristics of EWP to the secondary industry were rustic look, strength, and durability, which suggests that the secondary industry does not particularly desire these traits. As for regional comparisons, no significant differences in the importance of the given EWP characteristics were found between the three regions. When this test was performed without Log

home/Timberframe manufacturers, a single significant difference was detected. Respondents from New England rated "historical look" of EWP as significantly more important than the Mid-Atlantic respondents ($p = 0.05$).

Eastern White Pine Promotion and Service Characteristics

In an effort to better understand which types of promotional efforts the secondary industry responds to when buying EWP, a question was included in the questionnaire addressing this issue. The question gave a list of promotional efforts to choose from, and respondents were asked to select which ones they felt would influence them to buy EWP from a particular sawmill. Extra space was left blank for respondents to list promotion options not mentioned in the list. Results are presented in Figure 30.

As is illustrated in Figure 30, secondary mills reported being influenced to buy EWP lumber from mills that emphasized higher lumber quality. This was followed by mills emphasizing the quality of EWP from their region and a high emphasis on customer service. The results in Table 36 and Figure 29 indicate that most secondary mills believe that there is either no difference between lumber quality between the three regions or they have no opinion. The results presented in Figure 30 state that this may not be the complete story, and that perhaps regional quality differences in lumber quality do indeed exist. One explanation for this may be that secondary EWP manufacturers perceive quality differences between more local regions than were defined in this research (i.e., a mill in Wisconsin may not have an opinion on EWP from Virginia, but it may believe that Wisconsin produces better EWP than Michigan).

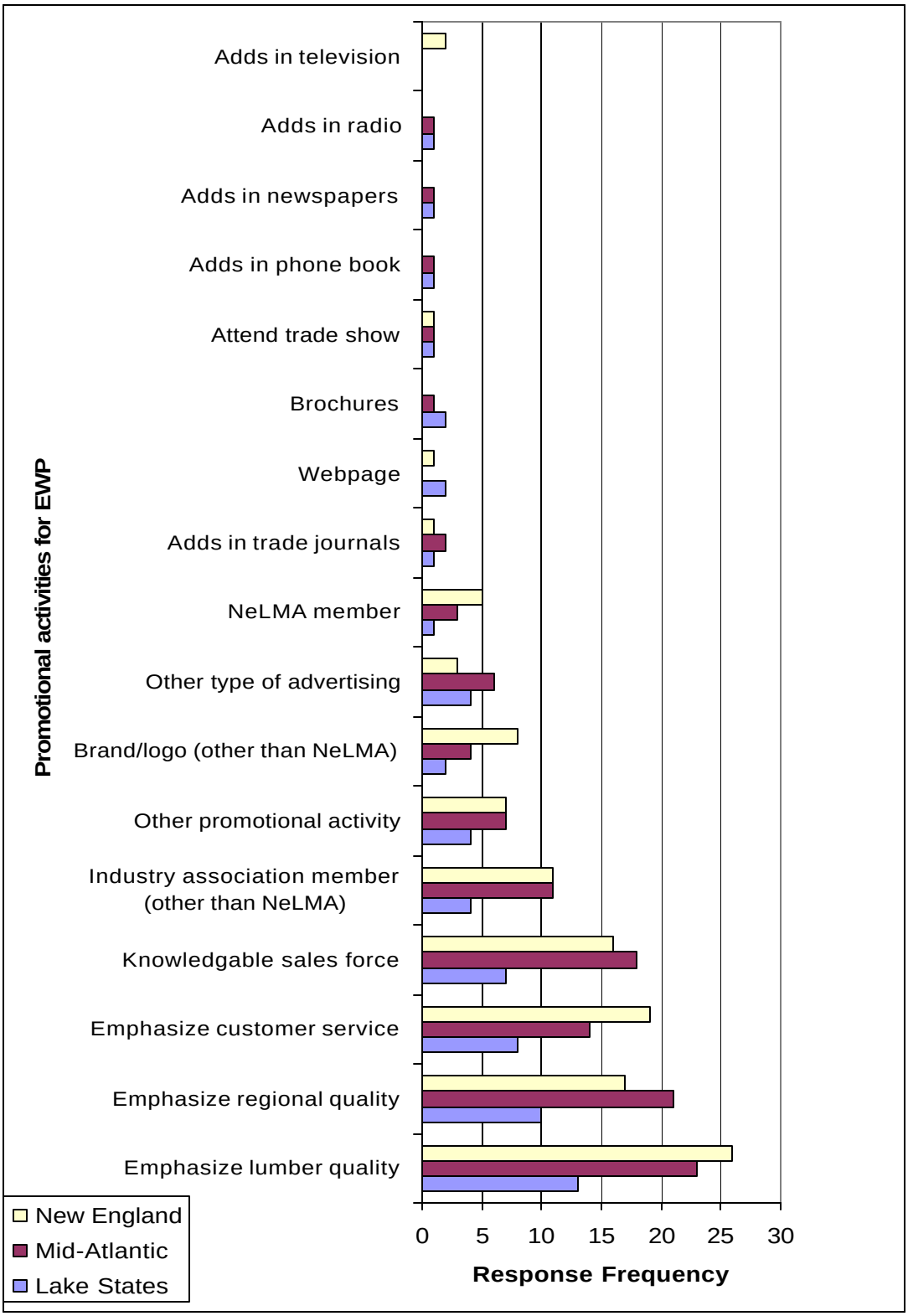

Figure 30. Respondents within the secondary industry stating which promotional activities influence them to buy EWP lumber from a particular sawmill.

Additionally, advertisement efforts across all media ranked the lowest in terms of promotional effectiveness. Attending trade shows, producing brochures, and having a web page also ranked low on the scale. The most common responses filled in for the "other type of advertising" category were word of mouth and personal contact with the sawmill. The most common responses filled in for the "other promotional activity" category had to do with proximity to the sawmill, availability of raw material, and personal contact with the sawmill. The most common responses filled in for the "industry association membership (other than NeLMA)" category were the Forest Products Association and NWFA.

To further examine the preferences for certain service characteristics held by the secondary EWP industry, a question was included that asked respondents to rate how highly they value certain services provided by their EWP lumber suppliers. Each question asked respondents to rate a series of service characteristics on a Likert-type scale of 1 to 7, with 1 being little effort, 4 being average effort, and 7 being high effort. This data was then compared using ANOVA at a = 0.05 significance level, and using Tukey's HSD post-hoc analysis to identify individual differences. Results are presented in Table 41.

Results presented in Table 41 indicate that consistent price is the most highly valued service for secondary EWP manufacturers overall, followed by on-time delivery and a good reputation. Flexible payment, product range, and just-in-time (JIT) delivery rated the lowest in value, although only flexible payment was rated below the "average value" point (4). Interestingly, on-time delivery rated very highly, but JIT delivery rated low. This implies that most secondary EWP manufacturers are comfortable with current

raw material lead times as long as they are predictable. As for regional comparisons, there were no significant differences found between the three regions concerning how much they value each individual service characteristic. When this analysis was performed without Log home/Timberframe manufacturers, the Mid-Atlantic region rated flexible payment as significantly more important than did respondents from the New England region ($p = 0.04$).

Table 41. Mean ratings on how highly secondary EWP manufacturers value certain service characteristics provided by their EWP lumber suppliers, by region.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region			Significance Level
			Lake States (1)	Mid-Atlantic (2)	New England (3)	
Consistent price	92	5.96	5.74	6.18	5.84	0.26
On-time delivery	92	5.95	5.77	6.11	5.88	0.55
Good reputation	95	5.93	5.83	6.11	5.79	0.53
Available to customer	93	5.73	5.74	5.71	5.75	0.99
Special orders	94	5.68	5.57	5.79	5.64	0.83
Understand customer needs	91	5.67	5.48	5.61	5.90	0.48
Solving customer problems	92	5.65	5.65	5.71	5.58	0.94
Strong business relationship	93	5.59	5.78	5.66	5.38	0.53
Knowledgable sales force	90	5.00	5.09	5.08	4.83	0.81
JIT delivery	90	4.69	4.77	4.79	4.50	0.78
Product range	92	4.63	4.52	5.11	4.13	0.08
Flexible payment	90	3.91	4.29	4.26	3.23	0.06

An additional characteristic that may lend a competitive advantage to a certain region is the adaptation of new technology. The questionnaire addressed this issue with a question that asked respondents to state how often they invested in new technology at their mill site by choosing from a list of given options. The options ranged from "More than 1 time a year", to "Less than 1 time every 10 years". It was thought that New England may have the highest rates of technology adoption of the three regions, which

may be cause for their stronger EWP markets relative to the other regions. Results are displayed in Figure 31.

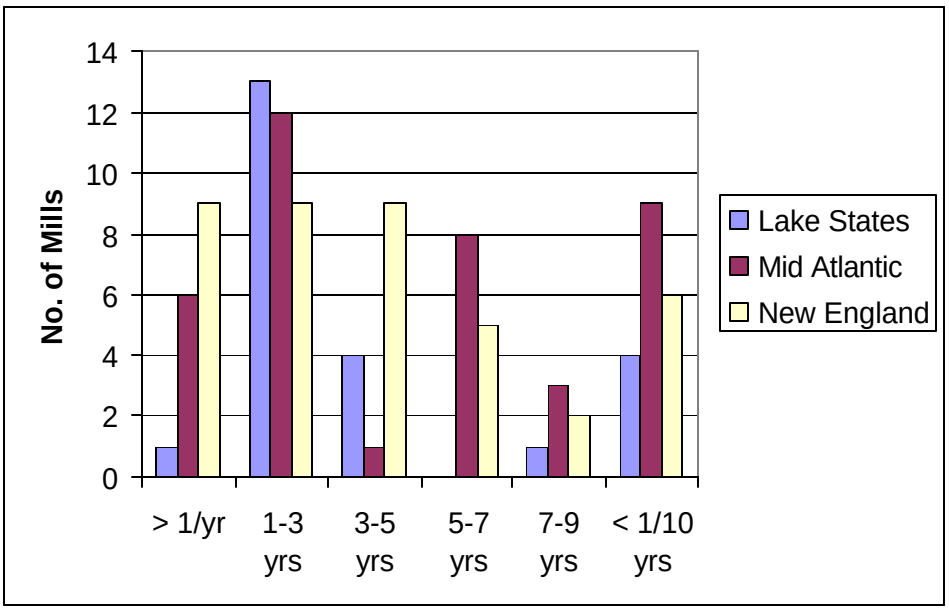

Figure 31. Frequency of technology investment among secondary industry, by region.

Results in Figure 31 indicate that the plurality of mills from each region invests in new technology once every 1 to 3 years. This is especially true in the Lake States where 74% of mills invest in new technology one or more times every 5 years. The New England region is slightly more distributed across technology rates, but the majority of New England mills (67%) are also investing in new technology one or more times every 5 years. The Mid-Atlantic region showed the slowest rates of technology investment, with 49% investing in new technology one or more times every 5 years, and the largest relative percentage of respondents reporting to invest in new technology fewer than one time every 10 years (23%). These findings do not support the hypothesis that New England would have the highest rate of technology adoption of the three regions, and

therefore is not likely to be the cause of competitive advantages experienced among secondary EWP manufacturers in New England.

As an attempt to gauge each region's general approach to marketing EWP lumber, a final question was included in the questionnaire asking respondents to state whether or not they proactively search for new markets for EWP lumber. This question was intended to provide an insight into the three regions' overall opinions about selling EWP, and their enthusiasm in doing so. Results for this question are displayed in Figure 32.

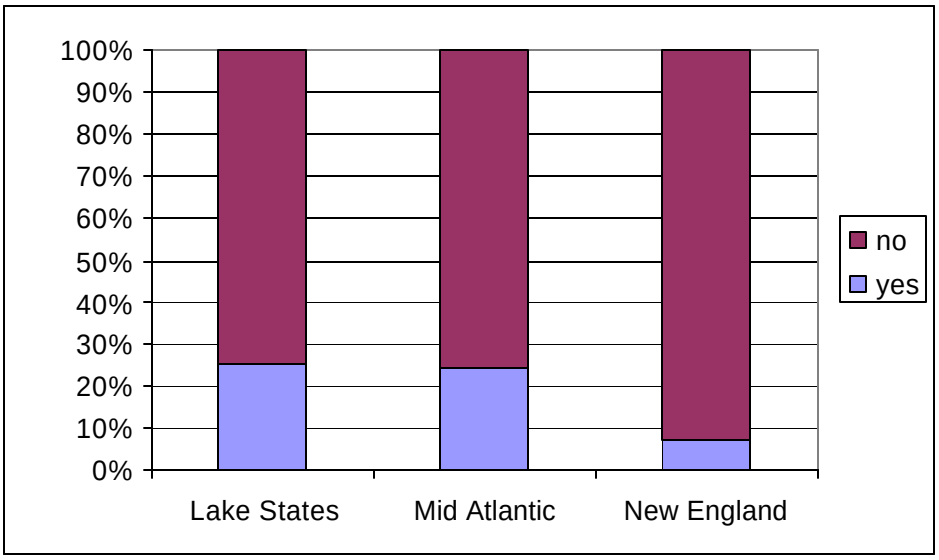

Figure 32. Percentage of companies stating whether or not they proactively search for new markets for EWP products.

Figure 32 indicates that 25% of secondary EWP manufacturers in the Lake State and New England regions claim that they proactively search for new markets for EWP products, while this figure is only 8% in New England. These results follow the same trends identified in Table 30, which suggest strong growth in EWP usage during the next 5 years in Mid-Atlantic and Lake State regions but little growth in the New England region. The implication of this trend is that EWP markets appear to be growing in Mid-

Atlantic and Lake State regions, and this will lead to opportunities for processors of EWP in all industry levels.

A final question was included that asked respondents to share their opinions on any other topic of concern to EWP markets that was not addressed elsewhere in the questionnaire. Many respondents commented on the properties of EWP and that it is good for processing. Others commented that they would buy more EWP lumber if they could find it, but it does not seem to be available in all areas. One respondent asked why more people do not dry EWP for selling. These comments seem to agree with general theme from the questionnaire results, which showed that availability was a leading barrier to utilizing more EWP. Many other respondents stated that EWP grades are confusing and lack standardization across larger areas. This claim is well justified, as EWP grading practices are known to change from region to region along the Eastern US. Finally, one respondent commented that EWP is the "optimal wood for making toys". It is possible that this market is under-serviced or overlooked due to the relatively small amounts of wood they consume, but the higher profit margins that are possible when turning a commodity into a specialty such as a toy or a carving may warrant this segment some added attention. As one respondent stated, "We buy (EWP) turning squares, but there are very few vendors in the marketplace."

Secondary Inter-Industry Comparison

Until this point in the results and discussion, the analysis of the secondary EWP industry has focused on market differences between the three regions of interest to this research. This section will focus on a comparison between the various secondary markets for EWP, probing for market characteristics that may be unique to any one industry.

Unlike primary manufacturers that produce essentially the same product categories (i.e., lumber, cants), the secondary industry is comprised of many different types of operations that produce many different products. This variety of products naturally entails a variety of raw material needs which must be met by suppliers, but it is not always clear which industries desire which characteristics from their raw material. This section will address these issues.

In Table 42, results are given for the number of respondents from each separate secondary industry. As is presented in Table 42, the "Other" category received the most total responses. The most frequent fill-in responses for this category had to do with arts-and-crafts shops, toy makers, turnings, and carvings. After this came moulding/millwork operations, log home/timber frame suppliers, and furniture manufacturers. All other categories received a very small response. This may have been attributed to the fact that several mills manufacture more than one of the listed products, yet they were asked to choose only the one product that constituted the majority of their operation. It is also possible that many of the other industries were not reached due to inadequate address information.

Table 42. Respondents from each secondary industry.

Industry	Frequency	Percent
Other	23	20.7%
Moulding / millwork	22	19.8%
Log home / timberframe	20	18.0%
Furniture	19	17.1%
Retail	5	4.5%
Cabinets	5	4.5%
Crate / container	5	4.5%
Window	4	3.6%
Dimension	4	3.6%
Door	3	2.7%
Flooring	1	0.9%
Total	111	100%

In order to produce a meaningful comparison of the data collected, the remainder of this analysis will focus on the four secondary industries that responded in sufficient numbers. The first four industries listed in Table 42 were selected due to the clear drop-off in responses seen after the "Furniture" category. It is believed that focusing the analysis on these industries will provide more statistically meaningful results than trying to incorporate data sets with less than five data points. Furthermore, since the "Other" category included so many craft-type respondents, it was decided to rename this category to "Arts / Crafts" after eliminating the few non-craft-related responses from the data set.

The first analysis looked at patterns in EWP consumption within these four industries. The same technique was used to perform this analysis as with Table 30. Respondents were asked to predict whether they plan to increase, decrease, or remain constant in their EWP lumber consumption volumes during the next 5 years, and estimate the percent change. This data was compared to responses for total EWP lumber production to generate an estimate of absolute change in EWP production. For example, if the respondent answered that they consume 1 MMbf of EWP, and they plan to increase consumption by 20%, then the net change would be an increase of 200,000 bdft. All of these net change values were added and then divided by the sum of EWP lumber consumption within the sample to give an estimation of absolute market size change during the next 5 years. Estimates of percent change are based solely on data received from respondents. Table 43 summarizes these results.

Table 43. Predicted growth trends for EWP in secondary markets, next 5 years.

	Secondary Industry			
	(N=16) Arts / Crafts	(N=20) Log home / Timberframe	(N=16) Furniture	(N=21) Molding / Millwork
Total produced (bdft)	333,930	29,879,000	233,990	10,430,070
Net change (bdft)	9,650	6,767,550	17,635	2,558,880
Percent change	2.9%	22.6%	7.5%	24.5%

Table 43 indicates that all markets are estimating an increase in utilization of EWP during the next 5 years. The fastest growing markets are projected to be Moulding/Millwork at 24.5% growth and Log home/Timberframe home construction at 22.6%. It was surprising to see the furniture industry increasing utilization of EWP because of the difficulty this industry has been having in recent years, but nonetheless they report a projected net demand increase of 7.5% during the next 5 years. The Arts/Crafts industry projected the smallest increase in demand at 2.9%.

The next analysis compared the same product attributes presented in Table 40, but this time combining all regions and comparing the four secondary market segments. The question asked respondents to rate certain factors of EWP that they believe give it an advantage over imported species such as radiata pine. Each question in the series asked respondents to rate the characteristics on a Likert-type scale of 1 to 7, with 1 being low importance, 4 being average importance, and 7 being high importance. This data was then compared using ANOVA at a = 0.05 significance level, and using Tukey's HSD post-hoc analysis to identify individual differences. Results for this analysis are given in Table 44.

Table 44. Mean ratings on the importance of certain EWP product attributes to the secondary industry, by market segment.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Industry				Significance Level
			(N=19) Moulding / Millwork	(N=20) Furniture	(N=22) Log Home / Timberframe	(N=23) Arts / Crafts	
Supports local industry	56	5.61	5.53	5.54	5.82	5.43	0.93
Fast delivery	55	5.36	4.82	5.85	5.42	5.67	0.36
Ordering	57	5.33	4.82	5.62	5.37	5.88	0.41
Few defects	53	5.25	5.06	6.08	5.17	4.00	0.09
Color	51	5.16	5.53	5.45	4.94	4.17	0.36
Dimensional Stability	54	5.07	5.00	5.62	5.00	4.33	0.47
Machinability	51	4.86	4.94	5.45	4.65	4.00	0.45
Product range	51	4.69	4.94	4.64	4.67	4.00	0.79
Low price	53	4.68	4.47	4.83	4.83	4.50	0.93
Historical look	55	4.62	4.78	5.08	4.22	4.33	0.72
Durability	51	4.49	4.53	4.64	4.47	4.17	0.97
Paintability	51	4.33	4.89	4.83	3.71	3.00	0.10
Strength	53	4.17	3.88	4.77	4.22	3.40	0.33
Rustic look	55	4.04	4.29	4.07	4.00	3.33	0.86
Other	5	4.00	n/a	7.00	2.50	1.00	0.13

Table 44 illustrates that support of local industry was once again the most important attribute to secondary manufacturers purchasing EWP raw material. As for market segment comparisons, the ANOVA revealed no significant differences between the four segments. The "Few defects" category came closest to being significant, which indicated that the Furniture industry is the most concerned about defects while the Arts / Crafts category was the least concerned.

To further examine the preferences for certain service characteristics held by the different secondary EWP market segments, a question was included that asked respondents to rate how highly they value certain services provided by their EWP lumber suppliers. Each question asked respondents to rate a series of service characteristics on a Likert-type scale of 1 to 7, with 1 being little effort, 4 being average effort, and 7 being high effort. This data was then compared using ANOVA at a = 0.05 significance level,

and using Tukey's HSD post-hoc analysis to identify individual differences. Results are presented in Table 45.

Table 45. Mean ratings on how highly secondary EWP manufacturers value certain service characteristics provided by their EWP lumber suppliers, by market segment.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Industry				Significance Level
			(N=19) Moulding / Millwork	(N=20) Furniture	(N=22) Log Home / Timberframe	(N=23) Arts / Crafts	
Good reputation	62	6.15	6.11	6.00	6.45	5.78	0.40
Consistent price	59	6.07	5.89	5.92	6.30	6.13	0.69
On-time delivery	59	6.00	5.53	6.15	6.30	6.14	0.14
Strong business relationship	60	5.95	5.89	5.92	5.90	6.25	0.87
Special orders	61	5.89	5.84	6.00	5.95	5.67	0.95
Available to customer	60	5.85	6.16	6.08	5.35	6.00	0.22
Understand customer needs	58	5.83	5.68	6.09	5.65	6.25	0.55
Solving customer problems	59	5.69	5.68	5.58	5.60	6.13	0.84
Knowledgable sales force	57	4.93	5.63	4.60	4.55	4.63	0.23
JIT delivery	57	4.81	4.58	4.64	4.95	5.29	0.78
Product range	59	4.49	5.26 [2]	3.58 [1]	4.65	3.63	**0.02 ***
Flexible payment	58	3.91	3.47	4.25	4.40	3.14	0.33

* Represents a significant difference within the group at the a = 0.05 level.

[1, 2] Represent significant differences between specific groups.

The results in Table 45 resemble those from Table 41, with a few exceptions. The top three most important service characteristics remained the same, with "Good reputation" first, followed by "Consistent price" and "On-time delivery". This ordering was different from the secondary industry showed in Table 41, where "Consistent price" rated first. The three least important characteristics remained exactly the same, with "Flexible payment" rating last, preceded by "Product range" and "Just-In-Time (JIT) delivery". As for inter-industry comparisons, the Moulding/millwork industry rated "Product range" significantly higher than did the Furniture industry. This implies that the Moulding/millwork industry demands a larger product mix from sawmills providing them

with sawn EWP products than does the Furniture industry. No other significant differences were detected.

One final characterization of secondary manufacturers was performed to assess the opinions on the impact of radiata pine across the various secondary industries. Respondents were asked to state how increasing imports of substitute species such as radiata pine had effected their operations. Possible answers were "positive", "negative", and "no effect". This characterization is the same as in Table 38, only that here they are broken out by secondary industry. Results are presented in Table 46.

Table 46. What effect have imported species such as radiata pine had on your operation? (by secondary industry)

Process	N	Positive	Negative	No effect
Moulding/millwork	21	14%	19%	67%
Loghome/timberframe	20	0%	15%	85%
Arts/Crafts	20	5%	20%	75%
Furniture	14	0%	14%	86%
Window	5	40%	0%	60%
Retail	5	0%	40%	60%
Dimension	4	0%	50%	50%
Crate/container	4	25%	0%	75%
Door	3	0%	33%	67%
Cabinets	2	0%	50%	50%
Flooring	1	0%	100%	0%
Total	99	7%	20%	73%

As is rendered in Table 46, the majority of respondents in all categories reported that they had no opinion regarding radiata pine's impact on their markets. Among the four industries with the largest response, the Furniture and Log home/Timberframe industries reported the fewest positive responses and the most no effect responses. Among the to four industries, the Moulding/millwork industry reported having the highest percentage of positive responses, with 14%. This implies that the Moulding/millwork industry saw the most benefit from radiata pine imports. However,

the Moulding/millwork industry also had a relatively high rate of negative responses, so any positive benefit was not shared industry-wide.

Conclusions

This research has determined that secondary EWP lumber consumption is expected to increase during the next five years in all regions, particularly in the Mid-Atlantic and Lake State regions, with projected growth of 25.6% and 10.1%, respectively. The typical secondary mill in the Lake State region uses EWP for less than 8% of its total production, which is a large contrast to mills in New England and Mid-Atlantic regions where this figure is between 50% and 80%. Most secondary mills in all regions had total annual sales of less than $1 million, and particularly in New England where more than 70% of mills were below $1 million in annual sales.

Secondary manufacturers within the three regions bought EWP raw material primarily from within their own region, although more than 30% and 16% of total raw material purchases were made from other regions in the Mid-Atlantic and Lake State regions, respectively. The most common reason for buying raw material from other regions was the lack of consistent local supply, followed by higher quality. New England was rated as having the overall highest quality EWP of the three regions, followed by the Lake State and then Mid-Atlantic regions. Secondary manufacturers within the Mid-Atlantic region rated EWP lumber from the Mid-Atlantic significantly higher in quality than secondary manufacturers in the Lake State region did.

When asked whether they believed there was a difference in lumber quality coming from the three regions, the vast majority of respondents reported having no

opinion, while those with opinions were divided about in half between yes and no. Maine was the most frequently cited US State with the highest quality EWP raw material.

More than 70% of respondents stated that imports of radiata pine have had no effect on their business. Of those reporting an effect, the large majority reported a negative effect. A comparison of certain raw material characteristics showed that price was the highest rated reason that people would buy radiata pine over EWP, followed by fewer defects and strength. Both Delivery and Ordering were rated as being less of a disadvantage for radiata pine in the Lake States than in the Mid-Atlantic region. Alternatively, the most important factor influencing secondary producers to buy EWP is that it supports local industry, followed by easier ordering and faster delivery.

As for promotional activities, secondary mills reported being influenced to buy EWP lumber from mills that emphasized their high lumber quality, followed by mills emphasizing the quality of EWP from their region and a high emphasis on customer service. When asked about the effectiveness of certain services, consistent price was the most highly valued service for secondary EWP manufacturers overall, followed by on-time delivery and a good reputation.

All three regions showed that a plurality of secondary EWP manufacturers invest in new technology at least once every 1 to 3 years, although the Mid-Atlantic region was slightly slower than the other two regions in adopting new technology. When asked if they proactively search for new markets for EWP products, 75% stated no in Mid-Atlantic and Lake State regions, with 90% stating no in New England.

An inter-industry comparison revealed that the Arts / Crafts, Log Home/Timberframe, Furniture, and Molding/Millwork industries all predict an increase

in demand for EWP lumber during the next five years, growing at 2.9%, 22.6%, 7.5%, and 24.5%, respectively. Additionally, it was found that the Moulding / Millwork industry rated "Product range" significantly higher than did the Furniture industry as a service characteristic provided by EWP lumber suppliers. The Log home/Timberframe and Furniture industries reported considerably fewer positive responses to increasing imports of substitute species than did the Moulding/millwork industry.

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Chapter 4: Assessing Primary vs. Secondary Markets for Eastern White Pine

Introduction

Eastern white pine (*Pinus strobus*) is a very significant species to the forest products industry in the eastern United States. It represents approximately 8.4% of the total volume of sawtimber on viable timberland, representing about 77.6 billion board feet of sawtimber (US Forest Service FIA Databank, 2003). With eastern white pine (EWP) representing such a large portion of eastern forests, there is a significant landowner interest in capturing more value from this material. Furthermore, EWP ranks 4th among species in its markets in overall board foot production along the Eastern US. This represents approximately 600 million board feet produced annually in eastern sawmills, which is more than either hard or soft maple, spruce/fir, cherry, ash, or hickory (alone, not combined) (US Census Bureau, 2003).

Despite the large quantities of EWP available in eastern forests, and its importance to the industry as a raw material, there has been speculation that EWP has not been capturing its potential value in many regions of the US for a number of reasons. First, it has been suggested that a growing disparity exists between the amount of EWP available in certain regions of the US and the amount being harvested in those regions. This disparity developed from the 1970's through the 1990's, and it now has begun to raise debate as to why certain regions are not making full use of their raw material (Irland, 1999 "Eastern White Pine"; Wiedenbeck, 2003). Some of the suggested reasons are quality differences, availability, production limitations, or competition from foreign species.

Aside from forest inventory issues, there is also a concern of high-value versus low-value products being produced from white pine roundwood. A general trend has been noted in the Mid-Atlantic and Lake States towards using white pine timber to produce more low-value products such as pulp stock, pallet cants, and OSB chips, whereas the New England area tends to produce more high-value lumber (Wiedenbeck, 2003). This has serious implications for landowners interested in selling timber in these regions. Further, finding higher-value markets for timber would not only serve individual landowners but also boost local economies by increasing the value of all white pine forestlands and allowing more profit to be made at each level of the distribution chain.

Another topic is the observation that sawmills in the Mid-Atlantic and Lake State regions are indeed sawing a significant amount of white pine, but they may be buying the logs from the New England area (Wiedenbeck, 2003). Considering the ample local white pine supplies in these regions, one would immediately postulate that some type of quality difference exists between the regions. However, quality differences may be perceptual and not based on actual differences. Alternatively, white pine may be difficult to access in certain areas, or local supplies may not be consistent enough to depend on for continuous production. Whatever the reason, it is certain that many parties stand to benefit from the improved raw material utilization that would result from an increased understanding of these markets.

Finally, there is the issue of imported species and the pressure that they are placing on markets for domestic species. Radiata pine's rapid influx into the market has been well documented during the past 10 years, and its extremely competitive price has threatened those markets it has entered. Many of radiata pine's applications, such as

moulding, millwork, and other milled dimension parts, are shared with eastern white pine, making the two species direct competitors (Horgen and Maplesden, 1997; Harding et. al. 1999). Compounding the situation, New Zealand and Chile currently report huge growing volumes of radiata pine, which means that supplies to the US are likely to increase or at least hold steady for the next 10 years (Jélves et. al. 1989; Horgen and Maplesden, 1997). None of this implies that white pine is facing unavoidable decline, but it is clear that action must be taken to investigate market opportunities for white pine if eastern forests are to realize their full economic potential.

A key element to this discussion lies in the differences that may exist between primary manufacturers and secondary manufacturers of eastern white pine. There is often a lack of communication between sawmills and secondary manufacturers that impedes the efficient handling and utilization of raw materials, and understanding these differences should enable both industries to better understand the needs and opinions of the other. It is the objective of this research to identify those differences in opinion and to assess their implications for the industry as a whole.

Research Objective

1. To identify differences between primary and secondary manufacturers of eastern white pine that may impede the efficient marketing and utilization of eastern white pine raw materials.

Methodology

This research was conducted with a mail survey that was sent to producers and consumers of eastern white pine (EWP). Two separate questionnaires were developed for each sample frame: one dealing with primary manufacturers and the other dealing

with secondary manufacturers. The purpose of these questionnaires was to gather information from the two industries and compare them. This comparison was intended to reveal differences between primary and secondary manufacturers that may be hindering the more efficient utilization of EWP raw materials. Some questions in the two questionnaires were designed similarly so the two data sets could be compared. Once developed, these questionnaires were then reviewed by the research committee, revised, and then pretested among industry representatives who were instructed to look for confusing or misleading questions, as well as suggest any topics that they felt to be important that may have been missed.

The industry was separated into three regions: Lake States (IL, IN, MI, MN, OH, WI), Mid-Atlantic States (KY, MD, NY, MC, PA, TN, WV, VA), and New England States (CT, ME, MA, NH, RI, VT). The sample frame from each region was collected on a state-by-state basis by contacting local authorities in charge of tracking the forest products industry in each particular state and requesting copies of industry directories. Directories that indicated species use were preferred but not always available.

When pretesting was finished and the sample frame completed, the initial mailing was sent to a total of 2,741 companies in April 2004 (1,292 primary, 1,449 secondary). This first mailing was followed by a follow-up postcard approximately 3 weeks later, a second questionnaire after another 2 weeks, and a second reminder postcard after another 3 weeks. Completed questionnaires were entered into the SPSS statistical software package, in conjunction with Microsoft Excel, for analysis. A copy of this questionnaire is included in the appendix.

Results

A total of 1,292 questionnaires were sent to primary eastern white pine (EWP) manufacturers, and 1,449 were sent to secondary EWP manufacturers. The response rate is broken down in the following Table 47.

Table 47. Regional breakdown of response rate.

	Primary	Secondary	Total
Questionnaires sent	1292	1449	2741
Completed questionnaires returned	185	111	296
Unadjusted response rate	14.3%	7.7%	10.8%
Unusable questionnaires	441	561	1002
Adjusted response rate	21.7%	12.5%	17.0%

The unadjusted response rate is the number of usable questionnaires returned divided by the total amount sent. The adjusted response rate was then calculated to account for bad addresses and questionnaires that were returned from mills that reported producing no eastern white pine (labeled "unusable questionnaires" in Table 47). The adjusted response rate was calculated by dividing the amount of completed questionnaires by the new total number of questionnaires after subtracting the unusable questionnaires from the total sent.

Adjusted Response Rate = Completed Questionnaires / (Total Sent – Unusable)

The primary industry yielded the highest response rate, with 21.7%, followed by the secondary industry with a 12.5% response rate. The relatively low response rate from the secondary industry is unfortunate but not uncommon in such survey efforts. However,

the secondary response was still satisfactory and sufficient to perform the intended statistical analysis.

Respondent Demographics

A number of questions in the questionnaire asked respondents to identify certain demographical characteristics about themselves. This information allows for a more detailed profile for mills in each region. By asking questions such as total sales, total employees, and number of mills owned by the company, it is possible to form a clearer picture of how mills in each region may differ.

The first such question asked respondents to estimate total gross sales at their specific mill location for the year 2003. Options given ranged from "Less than $1,000,000" to "Greater than $50,000,000". Table 48 presents these results.

Table 48. Total annual sales among primary and secondary EWP companies.

Total annual sales ($)	Primary (N = 166)	Secondary (N = 105)	Total
< 1 mil	45%	55%	49%
1-5 mil	28%	26%	27%
5-15 mil	14%	11%	13%
15-25 mil	4%	2%	3%
25-50 mil	5%	0%	3%
> 50 mil	2%	6%	4%
Total	100%	100%	100%

Table 48 indicates that most mills have less that $1 million total annual sales in both industries. The primary industry is distributed slightly more toward larger mills than the secondary, but the two show similar rates of decline into the larger annual sales categories. However, the secondary industry has a stronger presence in the highest

category of "greater than $50 million", which means that this industry may be composed of a few very large producers with the rest being smaller companies.

Another question asked respondents to state their job title. It is believed that the higher the rank in the organization, the more accurate the data will be due to the higher degree of familiarity with the business often possessed by higher officials. The most desirable titles would be "Owner", or "President", but other titles such as "Vice President" and "Manager" are also acceptable. The least desirable result would be a high amount of "other" selections, which would imply a higher degree of variability in the data. Table 49 below lists the options that were given, and the frequency of respondents holding each job title.

Table 49. Titles of respondents filling out questionnaire, by industry.

Title of respondent	Primary (N = 182)	Secondary (N = 110)	Total
President	30%	37%	33%
Vice Pres	10%	5%	9%
Owner	40%	37%	39%
Manager	10%	14%	12%
Sales	3%	0%	2%
Other	7%	6%	7%
Total	100%	100%	100%

As is presented in Table 49, the majority of respondents from both industries had the title of either President or Owner. There were also a significant number of Vice Presidents and Managers answering the survey, and relatively few respondents in the Sales category. There were a significant number of respondents in the other category, but the majority of these respondents reported being either procurement personnel or other titles for more specific management positions (i.e., plant manager, COO).

Respondents were also asked to state how many employees they have at their location by selecting from a given list of ranges. Results are given in Table 50.

Table 50. Number of employees at respondents' mills, by industry.

No. of employees	Primary (N = 179)	Secondary (N = 106)	Total
< 25	73%	75%	73%
25-50	13%	16%	14%
51-100	8%	5%	7%
101-200	5%	3%	4%
201-300	1%	0%	1%
301-400	0%	1%	0%
> 400	0%	1%	0%
Total	100%	100%	100%

Average employment numbers in the two industries were very similar (Table 50). The primary and secondary EWP industries reported that 73% and 75% of mills had less than 25 employees, respectively. This suggests that both industries are heavily skewed toward smaller operations. Additionally, only the secondary industry reported having mills with more than 300 employees. This implies that while few very large mills exist in either industry, it would be more likely to see such an operation within the secondary industry.

A final demographical question was asked to ascertain the number of mills operating single and multiple operations. Results are provided in Table 51.

Table 51. Company operates a single vs. multiple facilities.

No. of facilities	Primary (N = 179)	Secondary (N = 109)	Total
Single	87%	86%	87%
Multiple	13%	14%	13%
Total	100%	100%	100%

The results in Table 51 elucidate that primary and secondary EWP industries are about even concerning the ratio of single vs. multiple facilities, at about 7 to 1, respectively. These results and the results from Table 48 and Table 50 indicate that most EWP producing companies only operate one facility, and that facility is likely to have fewer than 50 employees.

Eastern White Pine Market Characteristics

An attempt was made to estimate average annual EWP consumption at primary and secondary mills in the Eastern US. Due to a few very large mills in each industry, a simple average of mill consumption among respondents was skewed towards higher production estimates. To counter this effect, outliers were identified as those outside 3 standard deviations of the original mean. A new mean and median were then calculated excluding those outliers. As shown in Table 52, there is still a relatively large gap between the mean and median estimates of average production. Based on the sample frame, it would be reasonable to report that the average mill sizes calculated excluding outliers in Table 52 are a reflection of the amount of EWP being used in each industry, while the median mill size represents the most common size for an EWP operation in that industry.

Table 52. Average annual EWP mill production/consumption among primary/secondary manufacturers, respectively.

	N	All Data Included (bdft)		Excluding outliers past 3 St. Dev. of original mean (bdft)	
		Average	St. Dev.	Average	Median
Primary	172	3,524,374	9,810,697	2,440,783	280,000
Secondary	98	497,093	1,211,413	330,686	13,500

Table 52 shows that the average EWP sawmill produces about 2,441,000 bdft per year, while the average secondary operation consumes a significantly smaller amount, around 331,000 bdft per year. This suggests that the majority of primary EWP production is done by a relatively small group of large mills that supply many secondary manufacturers.

To estimate the general trends in market size, respondents were asked to predict whether they plan to increase, decrease, or remain constant in their EWP lumber production volumes during the next 5 years, and to estimate the percent change. This data was compared to responses for total EWP lumber production to generate an estimate of absolute change in EWP production. For example, if the respondent answered that they produce 1,000,000 bdft of EWP, and they plan to increase production by 20%, then the net change would be an increase of 200,000 bf. All of these net change values were added and then divided by the sum of EWP lumber production within the sample to give an estimation of absolute market size change during the next 5 years. Estimates of percent change are based solely on data received from respondents. Table 53 summarizes these results.

Table 53. Predicted growth trends for EWP in primary and secondary industries, next 5 years.

	Industry	
	Primary	Secondary
Total produced (bf)	606,192,275	48,715,150
Net change (bf)	41,700,417	9,217,950
Percent change	6.9%	18.9%

Table 53 shows that both primary and secondary industries predict an increase in EWP utilization, with overall growth estimates of 6.9% and 18.9%, respectively. These growth rates indicate that both primary and secondary industries agree on the increased

utilization of this species. The secondary growth is particularly promising, because raw material use is driven largely by demand from this industry group.

Regional Comparisons Between Primary & Secondary Manufacturers

It had been suggested that primary and/or secondary manufacturers of EWP may be buying raw material from other regions, leading to inefficient utilization of EWP in their home regions. To address this issue, respondents were asked to state whether or not they buy EWP raw material from other regions, and then were presented with a list of possible situations causing them to by-pass local EWP supplies to buy sawn products from outside their regions. Results are presented in Table 54 and Table 55.

Table 54. Mills reporting whether they do or do not buy EWP raw material from outside their region.

Industry	N	No	Yes
Primary	181	90%	10%
Secondary	106	75%	25%

Table 54 illustrates that the secondary industry is more likely to buy raw materials from another region than the primary industry. Furthermore, as shown in Table 55, the single largest reason given by primary manufacturers for buying EWP logs from another region was that their mill was on the border between two regions, making any inter-region trade coincidental. Inter-region trade among secondary manufacturers was for more deliberate reasons, such as maintaining consistent supplies and getting high quality raw material, although many primary manufacturers also named availability of raw material as a reason for buying EWP from other regions. Many secondary manufacturers named "other" as a reason for buying raw materials from other regions, and most of the

fill-in responses for this had to do with availability, making it an even more frequent response than is shown in Table 55.

Table 55. Reasons given for buying EWP raw material from other regions.

Reasons for buying EWP in other regions	Mills responding from each industry		Total
	Primary	Secondary	
Consistent supply	8	11	19
Higher quality	6	9	15
Lower prices	4	7	11
Mill on border	10	1	11
Other	1	9	10
Easier buying	4	3	7
Better selection	1	5	6
Wider logs	1	1	2
Better forest mgmt.	1	0	1
Less disease	0	0	0
Higher growth ring count	0	0	0
Larger distance btw. nodes	0	0	0
More attractive color	0	0	0

To compare opinions about EWP coming from the three different regions, a question was included that asked respondents from the primary and secondary industries to rate the quality of EWP raw material grown in the three regions. The purpose of this question was to compare responses from primary and secondary manufacturers trying to identify a preference for a particular region between the two industry groups. The rating was on a Likert-type scale of 1 to 7, with 1 being low quality, 4 being average quality, and 7 being high quality. This data was then analyzed using an analysis of variance (ANOVA) to look for any regional differences in opinions about EWP quality in the three regions. The ANOVA was performed at $a = 0.05$ significance level. Results are presented in Table 56.

Table 56. Mean ratings of regional EWP lumber quality by primary and secondary EWP manufacturers.

Region Being Rated	N	Overall Mean	Mean Rating From Each Region		Significance Level *
			Primary	Secondary	
New England	166	5.14	5.03	5.29	0.19
Mid-Atlantic	149	4.56	4.56	4.53	0.78
Lake States	138	4.46	4.38	4.60	0.38

*A significance level of less than or equal to 0.05 is a statistical difference.

As presented in Table 56, the New England region rated the highest in overall quality, followed by the Mid-Atlantic and then Lake State regions. No differences were found between primary and secondary manufacturers in the ratings of raw material quality coming from individual regions. This implies that primary and secondary manufacturers of EWP generally agree on the quality of EWP coming from the various regions of the United States.

Two extra questions were asked to probe further into the respondents' opinions about regional quality differences. The first asked respondents to state whether they believed there was any physical difference in EWP logs coming from the three regions. This question essentially targets the same opinions surveyed in Table 54 - Table 56, but the approach is changed by asking respondents to check one of three boxes, stating either "Yes, there is a difference between the regions", "No, there is no difference", or "No opinion". The technique of asking different questions that target similar information is used to provide external validity to the questionnaire. Since the results in Table 54 show a majority of respondents buying EWP only from within their region, then finding a large amount of "No opinion" or "No, there is no difference" responses will suggest that the data is valid. Results are shown in Figure 33.

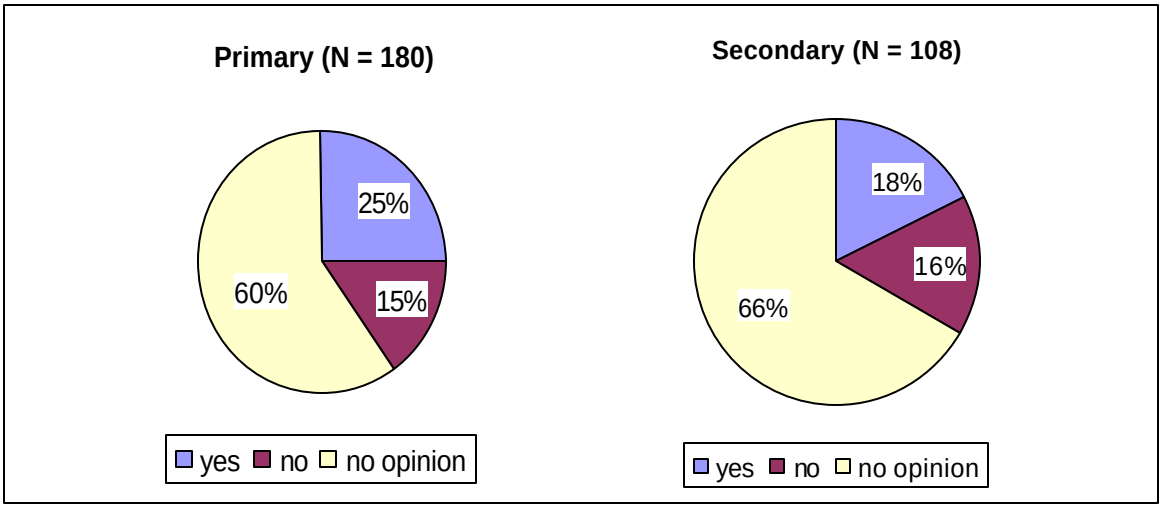

Figure 33. Opinions on the presence of a difference in raw material quality coming from the three different regions, by industry.

Figure 33 illustrates that the majority of respondents in both industries had no opinion about differences in raw material quality coming from the three regions. This result generally supports the findings from Table 54, which indicated that the large majority of both primary and secondary manufacturers do not buy raw materials from outside their respective regions. If respondents have no experience with wood from other regions, then it is logical that they have no opinion about quality differences, as is the case in Figure 33. However, primary manufacturers were more likely than secondary manufacturers to report that they see a difference in EWP raw material quality between the regions. This is also a logical result because sawmills must deal with logs as a raw material, which can have highly variable quality, as opposed to secondary manufacturers which deal mostly with a grade-sorted product (lumber) that should have less quality variation.

The second question used to validate responses on regional quality differences asked respondents to identify the US State in which they percieved the highest quality

EWP was produced. Again, it was predicted that the majority of respondents would name a New England State, which would validate earlier findings. Table 57 displays these results.

Table 57. Regional tally of responses for the US State producing the highest quality EWP raw material.

Region	Primary (tally, %)		Secondary (tally, %)	
New England	73	58%	46	60%
Mid-Atlantic	32	25%	18	23%
Lake States	21	17%	13	17%
Total	126	100%	77	100%

Table 57 indicates that States in the New England region were mentioned most frequently as producing the highest quality EWP raw materials among both primary and secondary manufacturers. This data supports earlier findings in Table 56, which shows that New England rated best overall in raw material produced in that region, followed by the Mid-Atlantic and Lake State regions. Primary and secondary manufacturers were also very closely aligned in regional selection, with no percentage of responses varying by more than 2% between the two groups. The most frequently mentioned individual states were Maine (66), New Hampshire (25), New York (19), Vermont (18), North Carolina (14), Wisconsin (13), Michigan (11), and Minnesota (9).

Effect of Imported Species

One of the possible reasons for underutilization of EWP among primary and secondary manufacturers is pressure from imported species. During the past 10 to 15 years, imports such as radiata pine and scotts pine have entered the US marketplace and disrupted traditional value chains for competing domestic species, such as EWP (Horgen and Maplesden, 1997). One of the objectives of this research was to assess the impact of

these imported species on both primary and secondary EWP markets. This objective will now be addressed with a comparison of how these two industry segments view both eastern white pine and its imported competitors.

The first step was to evaluate the industry's opinions on whether the influx of imported species has had a positive or negative effect on their operation. The options given were, "Positive", "Negative", and "No effect". An open-ended area was left for respondents to elaborate on this opinion. The results are displayed in Table 58.

Table 58. What effect have imported species such as radiata pine had on your operation?

Effect	Primary (tally, %)		Secondary (tally, %)	
Positive	7	4%	7	7%
Negative	70	41%	20	20%
No effect	95	55%	72	73%
Total	172	100%	99	100%

Table 58 indicates that the majority of both primary and secondary manufacturers reported that imported species have had no effect on their operation. This was especially true for secondary manufacturers, where 73% reported no effect. A large portion of the primary industry, 41%, reported that imported species have had a negative impact, while only 20% of secondary manufacturers reported a negative impact. This implies that imported species are hurting primary manufacturers much more than secondary manufacturers. This makes sense, because import species provide secondary manufacturers with a cheap raw material option. In fact, it was surprising that only 7% of secondary manufacturers reported a positive impact on their operation, because a cheaper raw material option should be a boon for companies looking for a way to cut costs. This low percentage indicates that secondary manufacturers must prefer something about EWP that is making them resist changing to import species.

To look at some of those possible factors that may be advantageous for EWP, respondents were asked to rate the importance of certain raw material attributes when purchasing EWP as opposed to various substitute species such as radiata pine or ponderosa pine. Both primary and secondary industries were asked essentially the same question, with the primary question worded, "How important do you believe the following attributes are to your customers?", and the secondary question worded, "How important are the following attributes to you when buying EWP?" The purpose of these ratings was to see if primary and secondary industries hold different opinions about the importance of certain attributes of EWP. Each question in the series asked respondents to rate the characteristics on a Likert-type scale of 1 to 7, with 1 being low importance, 4 being average importance, and 7 being high importance. This data was then compared using ANOVA at a = 0.05 significance level. Table 59 provides results for this analysis.

Table 59. Mean ratings on the importance of EWP product attributes to primary manufacturers vs. secondary manufacturers, as compared to substitute species.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region		Significance Level *
			Primary	Secondary	
Attractive color	226	5.17	5.28	4.96	0.17
Supports local industry	236	5.03	4.89	5.30	0.12
Machinability	233	4.99	5.22	4.53	**< 0.01***
Ordering	234	4.97	4.83	5.24	0.07
Fast delivery	229	4.93	4.79	5.17	0.10
Dimensional Stability	229	4.85	4.94	4.68	0.28
Product range	226	4.62	4.77	4.32	**0.05***
Low price	230	4.51	4.38	4.75	0.14
Few defects	227	4.42	4.27	4.70	0.08
Rustic look	232	4.35	4.61	3.86	**0.01***
Historical look	234	4.29	4.38	4.13	0.38
Paintability	226	4.28	4.35	4.14	0.42
Other	22	4.27	4.92	3.50	0.22
Durability	226	4.13	4.15	4.09	0.80
Strength	229	3.61	3.47	3.89	0.08

* Data in boldface type indicates the presence of a significant difference.

As is presented in Table 59, “Attractive color” rated the highest overall as EWP’s strongest attribute, meaning that both primary and secondary manufacturers generally agree that EWP’s attractive color give it an advantage over other substitute species. This was followed by supporting local industry and machinability. However, the comparison indicated that primary manufacturers believe that machinability is very important to their customers, while the secondary manufacturers reported a significantly lower importance placed on machinability of EWP. This result suggests that primary manufacturers may be emphasizing the high machinability of EWP as a great advantage, while their customers are not as concerned with this attribute. The same relationship was found regarding product range and the “rustic look” of EWP. The secondary industry reported being significantly less concerned with these attributes than the primary industry believed. The least important overall attributes were strength and durability, which primary and secondary manufacturers agreed were not important factors in their decision to use EWP.

Another important aspect of the analysis in Table 59 was analyzing the attributes rated most important to secondary manufacturers of EWP, because this is the group buying lumber from sawmills and it is their opinion that most influences demand for EWP lumber. Table 59 indicates that “Supporting local industry” was the single most important factor for secondary processors of EWP, followed by ease of ordering and quicker delivery. This indicates that emphasizing the fact that EWP is grown and processed in the US may give domestic secondary operations more incentive to utilize it. This also suggests that the ability to deliver quickly with a simple ordering process is another advantage for EWP that secondary manufacturer’s value.

Eastern White Pine Promotion and Service Characteristics

An effort was made in the questionnaire to better understand which types of promotional activities the primary and secondary industries are involved in concerning EWP. The question addressing this issue gave a list of promotional efforts to choose from, and primary respondents were asked to select the promotional activities they were involved in, while secondary respondents were asked to select which promotional activities they felt would influence them to buy EWP from a particular sawmill. Extra space was left blank for respondents to list promotion options not mentioned in the list. Results can be found in Figure 34.

Figure 34 suggests that while the primary industry is generally involved in many types of promotional efforts, the secondary industry does not report being particularly receptive to most of them. The secondary industry reported that the most effective promotional efforts were related to the emphasis of lumber quality or customer service. However, most mills already state that they try to provide a high quality product with good customer service, so emphasizing these aspects would only keep a sawmill on par with the industry rather than providing a unique competitive advantage. The promising result presented in Figure 34 was the large secondary response to "Emphasize regional quality". This suggests that a sawmill may be able to develop a competitive advantage by promoting the fact that its lumber is from a certain region.

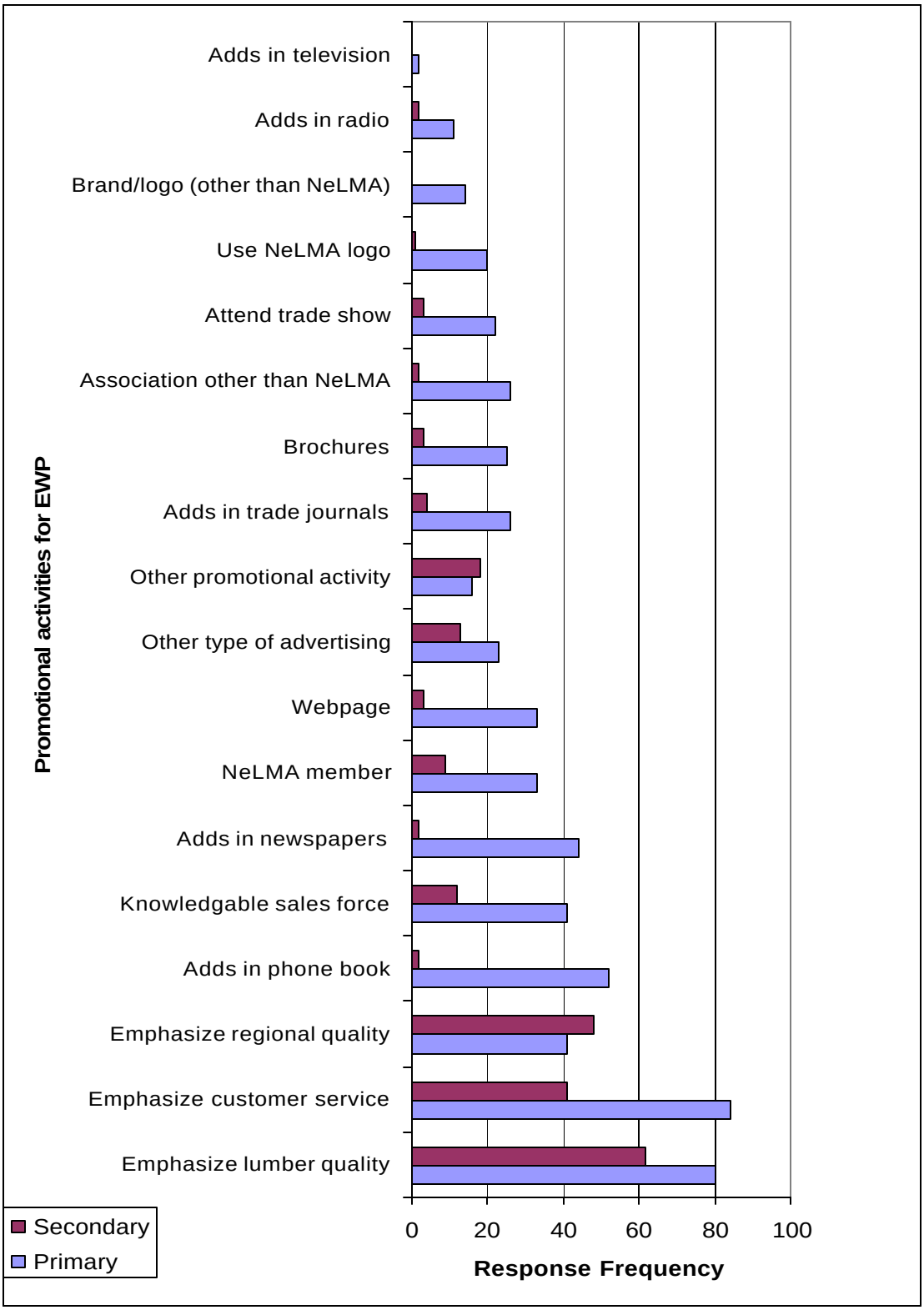

Figure 34. 1) Primary industry members stating which promotional activities they are involved in and 2) Secondary industry members stating which promotional activities influence them to buy EWP lumber from a particular sawmill.

The most common fill-in response from secondary manufacturers for the "Other promotional activity" category from Figure 34 was the location of the sawmill and its proximity to the respondent. This is obviously not an advantage that all sawmills can benefit from due to immobile sawmill operations, but this could certainly be used as an advantage by sawmills with many nearby customers. The most common response from primary manufacturers was "word of mouth", and focusing on local markets. The most common fill-in response from both industries for "Other type of advertising" was word of mouth.

To further examine the preferences for certain service characteristics held by the primary and secondary EWP industries, a question was included that asked respondents to rate how highly they value certain services provided by their EWP lumber suppliers. The question aimed at the primary processors asked respondents to rate each service characteristic based on how much effort and expense their company invests to provide each service, and the secondary question asked respondents to rate how much they valued each service from their EWP raw material suppliers. Each question asked respondents to rate the series of service characteristics on a Likert-type scale of 1 to 7, with 1 being little effort, 4 being average effort, and 7 being high effort. This data was then compared using ANOVA at a = 0.05 significance level. The purpose of these ratings was to see if primary and secondary industries hold different opinions about the importance of the selected service characteristics. Results are presented in Table 60.

Table 60. Mean ratings on how highly EWP manufacturers value certain service characteristics provided by their EWP lumber suppliers, by industry.

Characteristic Being Rated	N	Overall Mean	Mean Rating From Each Region		Significance Level *
			Primary	Secondary	
Good reputation	269	6.09	6.18	5.93	0.11
On-time delivery	261	5.70	5.57	5.95	**0.04***
Understand customer needs	263	5.65	5.63	5.67	0.84
Special orders	266	5.64	5.62	5.68	0.76
Available to customer	267	5.63	5.57	5.73	0.38
Solving customer problems	265	5.62	5.60	5.65	0.76
Strong business relationship	259	5.55	5.53	5.59	0.76
Consistent price	262	5.54	5.31	5.96	**< 0.01***
Knowledgable sales force	257	4.75	4.62	5.00	0.13
Product range	261	4.70	4.73	4.63	0.66
JIT delivery	256	4.37	4.19	4.69	**0.04***
Flexible payment	256	3.50	3.28	3.91	**0.01***

* Data in boldface type indicates the presence of a significant difference.

Table 60 indicates that having a good reputation was the highest overall rated service characteristic between primary and secondary manufacturers, followed by on-time delivery and understanding customer needs. However, the analysis shows that the secondary manufacturers valued on-time delivery significantly higher than the primary manufacturers believed they did. This relationship was also true for maintaining consistent prices, providing Just-In-Time (JIT) delivery, and offering flexible payment options; all of these service characteristics were valued significantly higher by secondary manufacturers than primary manufacturers believed. This implies that the primary industry may be underestimating the need for on-time delivery, maintaining consistent prices, providing Just-In-Time (JIT) delivery, and offering flexible payment options, and so sawmills that focus on improving these services may gain an advantage. However, flexible payment and JIT delivery were also rated the lowest overall in importance by the

two industries, so it would probably be most effective for sawmills to concentrate efforts on improving the top two service characteristics (maintaining a good reputation, and on-time delivery).

Lastly, as an attempt to gauge each industry's general approach to marketing EWP lumber, a final question was included in the questionnaire asking respondents to state whether or not they proactively search for new markets for EWP lumber. This question was intended to provide an insight into both primary and secondary manufacturers' opinions about selling EWP, and their enthusiasm in doing so. Results are displayed in Figure 35.

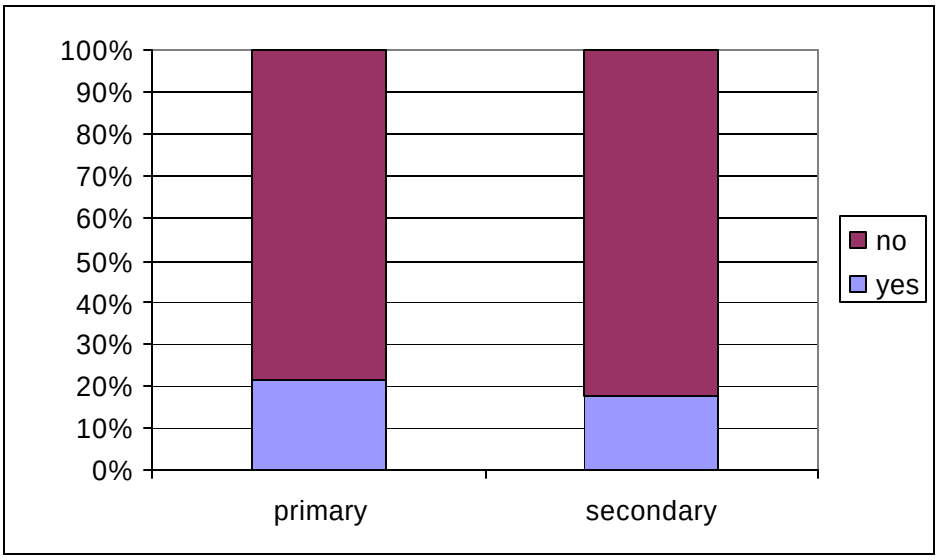

Figure 35. Percentage of companies stating whether or not they proactively search for new markets for EWP products, by industry.

Figure 35 reports that 21% of primary respondents reported that they proactively search for new markets for EWP, compared to 18% of secondary respondents. Twenty percent of the industry planning or attempting to offer more products made from EWP represents relative optimism in the marketplace. This amount would likely be higher if

more mills were willing to invest in increasing capacity, but communications with sawmill personnel indicate that many mills are wary of increasing debt loads. However, these results coupled with the results given in Table 53 which project a 7% increase in primary production and an 18% increase in secondary utilization of EWP during the next 5 years indicate that the market for EWP is currently strong and will be getting stronger in the near future.

Conclusions

This research has determined that the primary manufacturing industry is projected to increase EWP production by about 7% during the next 5 years, with an 18% increase in the secondary industry. Most primary and secondary mills generate less than $5 million in total annual sales, and have less than 25 employees. About 87% of both primary and secondary operations using EWP are only a single facility. As for regional comparisons between primary and secondary industries, it was found that only 10% of primary manufacturers buy raw materials from outside their region, and this was mostly due to mills being located on the border between two regions. The secondary industry bought raw material from other regions more frequently, with 25% of mills reportedly doing so. The main reason given for this was to maintain a consistent supply, though availability of high quality material was also mentioned frequently.

Both primary and secondary manufacturers rated New England as having the highest quality raw material, followed by the Mid-Atlantic and then the Lake State regions. No differences in opinion on material quality from a particular region were found between primary and secondary manufacturers. Additionally, 60% of primary manufacturers and 66% of secondary manufacturers stated that they have no opinion on

differences between the three regions in EWP raw material quality. Of those having an opinion, the primary manufacturers tended to believe that a difference existed more often than secondary manufacturers, with "yes" response rates of 25% and 18%, respectively. Finally, when asked to name a US State that produces the best EWP raw material, both primary and secondary industries responded most frequently with New England States, followed by the Mid-Atlantic and then the Lake States.

Most respondents within both primary and secondary industry reported that imported species such as radiata pine have had no effect on their operation. However, primary manufacturers were more likely to report a negative effect than their secondary counterparts, with negative response rates at 41% and 20%, respectively. When asked about the importance of certain attributes of EWP in comparison to substitute species, the attractive color of EWP and its support of local industry rated highest overall, with strength and durability rating the lowest. The primary industry overestimated how highly secondary manufacturers valued machinability, product range, and the rustic look of EWP, as significant differences were found in all of those categories.

While the primary industry seemed to be well represented across all forms of promotional activity, the secondary industry appeared to only be interested in the emphasis of high lumber quality, customer service, and regional quality. The first two of these were not surprising, but the regional quality aspect suggests that mills may be able to gain an advantage by advertising the fact that their raw material comes from a certain geographical region. "Word of mouth" was also a significant advertising vehicle.

When asked to rate the importance of certain service characteristics regarding EWP, a good reputation and on-time delivery were rated the highest overall, while

flexible payment arrangements and Just-In-Time (JIT) delivery were rated the lowest. Primary manufacturers underestimated how highly secondary manufacturers valued on-time delivery, consistent price, JIT delivery, and flexible payment options, as significant differences were found in all of these categories. However, since JIT delivery and flexible payment options rated as the two lowest valued service characteristics overall, they probably do not deserve the same attention as the higher-rated service characteristics. Finally, 21% of primary manufacturers and 18% of secondary manufacturers reported proactively searching for new markets for EWP. This is considered a relatively high level, which suggests that markets for EWP are generally strong and growing.

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Chapter 5: Personal Interviews

Introduction

This research has focused on the results of a mail survey up to this point. This section focuses on the results of a series of personal interviews that were conducted with industry representatives involved in markets for eastern white pine (EWP). The quantitative data that is received from a mail survey is effective at isolating differences in aspects that the researcher determined were important, but survey efforts have historically proven to be relatively ineffective at allowing the survey participants to raise new topics that may not have been addressed in the questionnaire and elaborating on topics brought up in the questionnaire (Burns and Bush, 2000). A qualitative approach is needed to collect this type of information, and the personal interview is an effective approach to collecting that data.

This combination of both quantitative and qualitative information is called *pluralistic research*, and utilizing this method can greatly increase the accuracy of the study by benefiting from the advantages of both types of information while minimizing the disadvantages (Burns and Bush, 2000). This is because the weaknesses of one method are compensated for by the strength of the other, and vise versa.

Research Objectives

1. To identify any internal bias for lumber from a particular region that may exist among manufacturers of eastern white pine by means of a photograph comparison.

2. To validate the results of a mail survey conducted within the primary and secondary eastern white pine industries in New England, Mid-Atlantic, and Lake State regions of the United States.

Methodology

Once analysis of the mail survey was complete, a series of interviews were conducted among eastern white pine (EWP) processors. The purpose of these interviews was to validate the results of a previous mail survey and to gather information on additional subjects that may not have been addressed in the questionnaire. Primary and secondary EWP processors were interviewed. Many interviewees were involved in both processes, as that is the nature of the EWP industry. Companies that were involved in both processes were asked to answer questions as they pertained to their operation in general rather than a specific process.

The interview consisted of two separate sections. The purpose of the first section was to investigate whether or not interviewees has an internal preference for EWP coming from a particular region of the United States. To do this, the industry was separated into the same three regions used in the mail survey. These three regions are broadly defined the New England, Mid-Atlantic, and Lake State regions. Eastern white pine lumber sawn from each of these regions was collected and photographed. Six lumber samples were taken from each region, all 6 feet in length and random width. Thickness was not important, as the boards were all graded on a best-face basis, and this was the only dimension photographed. All boards were as close as possible to "Premium" grade, as defined by the Northeastern Lumber Manufacturers Association (NeLMA). Two photographs were made of the lumber samples, with each photograph

containing three of the samples selected at random from each region. The first photograph generically labeled the regions as 1, 2, and 3, while the second photograph displayed the New England, Mid-Atlantic, and Lake State region labels for each board group. Interviewees were asked to rank the three groups of boards in the photographs on a series of material quality attributes. This was done with the unlabeled photograph first, followed by the photograph displaying the region labels. It was believed that if the actual quality of the boards were held constant, then any one region consistently rated higher than the others must be the result of internal bias for a particular region.

The second section consisted of a list of questions chosen to further investigate and validate selected findings from the mail survey. These questions were asked in the form of an informal interview, where interviewees were asked the questions on the list, but also encouraged to provide additional information as they felt necessary. Interviews typically lasted 1 ½ hours, and were held on-site at mills. The interview questions and lumber photographs are located in the appendix of this thesis (see Appendices 5, 6, 7).

Results

A total of 19 companies were interviewed for this section of the research. An effort was made to interview at least 3 primary and 3 secondary manufacturers of EWP in each region, but many companies actually produced both, so finding individual primary or secondary operations was difficult in some instances. The breakdown of mill types visited in each region is listed in Table 61. The New England region had the highest concentration of mills producing both primary and secondary products. This higher degree of vertical integration was an advantage to these mills in the New England region, because they were able to add more value to the lumber without adding shipping costs.

However, this is not to imply that mills sawing EWP in other regions were struggling to compete. The general theme of the interviews in each region and in every industry sector was that markets are strong for EWP, and the single largest limiting factor to selling more EWP products is not finding markets but rather finding enough raw material.

Table 61. Interviews held in each region, by industry.

Industry	New England	Mid-Atlantic	Lake States
Primary	0	2	2
Secondary	1	3	3
Both	5	1	2

Lumber Comparison

As described in the methodology, the first section of each interview consisted of showing the interviewee two photos of EWP lumber coming from the three regions included in this study. The first photo gave the regions generic labels (region 1, 2, 3), while the second photo provided regional labels (New England, Mid-Atlantic, Lake States). Interviewees were asked to rank the three regions from best to worst on a series of characteristics. These characteristics were color, color consistency, fewest defects, grain pattern, knot spacing, knot size, black/loose knot content, and best overall. These characteristics were chosen because they were discernable from a photo, and can be judged from a sample of only three boards. The reasoning behind this experiment was that since the quality of the boards was held constant across all board samples, the rankings should 1) be somewhat equal across the three regions, and 2) should not change from the first photo to the second.

The goal of this experiment was to detect any internal bias for lumber coming from a certain geographical region of the US. Therefore, while each quality

characteristic being ranked mentions a different lumber attribute, they are all truly testing to see if an overall regional bias exists. Since all the characteristic rankings were essentially testing for the presence of internal bias, the ranking data was grouped together from each region and analyzed as a whole. The total number of best, middle, and worst rankings for all characteristics were tallied for each photograph in each region. This tally was then translated into a percentage of total rankings that could be used to compare the first photograph to the second, looking for general trends in the amount of "Best", "Middle", and "Worst" rankings that each region received. The results from the New England region are presented in Table 62.

Table 62. Ranking tallies from New England respondents for comparisons between the unlabeled photograph and the labeled photograph.

Region & Photo Group (regions labeled vs. unlabeled)	Total Ranking Tally		
	Best	Middle	Worst
New England, Unlabeled	50%	45%	5%
New England, Labeled	61%	27%	12%
Mid-Atlantic, Unlabeled	38%	43%	19%
Mid-Atlantic, Labeled	34%	49%	17%
Lake States, Unlabeled	19%	2%	79%
Lake States, Labeled	20%	17%	63%

$N_{unlabeled} = 42$, $N_{labeled} = 41$

The results from Table 62 indicate that respondents from New England gave their own region 50% of the "Best" rankings when the regions were not given, and this rose to 61% of the "Best" rankings when the label was given. However, the percentage of "Worst" rankings for the New England region rose as well. This indicates that New Englanders may have a slight bias toward lumber from their own region. New England respondents also upgraded the boards from the Lake States, giving them 16% less

"Worst" rankings from the unlabeled to the labeled photos. However, the "Best" rankings remained essentially the same. No trends were recognized within the Mid-Atlantic rankings.

The same procedure was done to the data collected from the Mid-Atlantic region, and results are given in Table 63.

Table 63. Ranking tallies from Mid-Atlantic respondents for comparisons between the unlabeled photograph and the labeled photograph.

Region & Photo Group (regions labeled vs. unlabeled)	Total Ranking Tally		
	Best	Middle	Worst
New England, Unlabeled	37%	42%	21%
New England, Labeled	53%	34%	13%
Mid-Atlantic, Unlabeled	63%	35%	2%
Mid-Atlantic, Labeled	50%	50%	0%
Lake States, Unlabeled	16%	14%	70%
Lake States, Labeled	3%	24%	74%

$N_{unlabeled} = 43$, $N_{labeled} = 38$

Table 63 illustrates that the respondents from the Mid-Atlantic region increased their amount of "Best" ratings for the New England region by 16% from the unlabeled to the labeled photo, while the "Worst" ratings decreased by 8% as well. This suggests that Mid-Atlantic respondents were likely biased toward lumber from the New England region. Additionally, Table 63 indicates that both Mid-Atlantic and Lake State regions had 13% fewer "Best" ratings from the unlabeled picture to the labeled picture, showing that a negative bias may exist toward lumber from those regions.

Finally, Table 64 presents these same results from the Lake State region.

Table 64. Ranking tallies from Lake State respondents for comparisons between the unlabeled photograph and the labeled photograph.

Region & Photo Group (regions labeled vs. unlabeled)	Total Ranking Tally		
	Best	Middle	Worst
New England, Unlabeled	35%	48%	17%
New England, Labeled	38%	42%	21%
Mid-Atlantic, Unlabeled	52%	35%	13%
Mid-Atlantic, Labeled	57%	30%	13%
Lake States, Unlabeled	21%	15%	65%
Lake States, Labeled	15%	17%	68%

$N_{unlabeled} = 48$, $N_{labeled} = 53$

Table 64 suggests that no clear trend in regional quality bias emerged among respondents in the Lake State region. Lake State respondents did reduce the percentage of "Best" rankings that they gave their own region by 6%, while New England and Mid-Atlantic regions increased by 3% and 5%, respectively. However, this does not indicate any strong trend, suggesting that EWP manufacturers in the Lake States do not have a significant internal quality bias for any one region.

Interestingly, the Lake States seemed to be ranked the lowest in quality regardless of the region making the rankings and regardless of the photo that respondents were evaluating. This suggests that the Lake State boards were of a lower quality than the other groups. This does not affect the comparison between the unlabeled and labeled photos, because any ranking change from one to the other would still indicate a regional bias. However, this does reduce the credibility of inter-region comparisons within individual data sets. For example, comparing the labeled photo rankings for New England in Table 62 with the labeled photo rankings for the Lake States in Table 64 would be unreliable, because it seems as if the quality of the Lake State boards was

lower. However, comparing the unlabeled photo rankings for New England to the labeled photo rankings for New England in Table 62 is reliable, because the quality was consistent between the two photos.

When asked if they had any comments in general about the photos, many respondents from across all regions stated that any of the boards in the photos could have come from their region, and generally they appeared to be good quality lumber. Most respondents commented that they liked the brightness of the lumber, and that color was an important factor for them. That comment supported findings in Chapters 2 & 4, which showed that an attractive color was a desirable trait for EWP lumber. Many mills also stated that the boards were all very similar in quality, which was expected because keeping the boards similar was a planned part of the experiment. This was especially true between the Mid-Atlantic and New England board samples, which many respondents said could have come from the same tree.

Another common statement was that the group of boards from the Lake States has a higher content of black knots, which is bad for most purposes, but the content of clear cuttings in the Lake State boards was the most desirable of the three groups. They stated that this lumber would be good for a moulding manufacturer or a cut-up shop, because they tend to want long clear lengths. Black knots were extremely undesirable for all other applications, though, and were the main reason that the Lake State boards received such low rankings. This statement was particularly frequent among Lake State interviewees, who also asked how the boards were selected and if they were supposed to be representative of all lumber coming from the Lake States. A few manufacturers also

commented that a whole region cannot be represented by only three boards. This is a valid argument, and one that must be considered as a limitation of the experiment.

Interview Question Responses

Lumber Grading Practices

The first question asked interviewees to describe their grading practices, and explain why they chose that method. Companies in the New England region almost always used the NeLMA grades. The main reason given for this was that using NeLMA grades provides a measure of consistency that is necessary when producing large volumes. It also provides a benchmark quality measurement that can be used as an industry standard. Many also said that they do have special grades that they sort by request for certain customers, with one mill sorting entirely by customer specification. Most secondary processors in the New England region also used NeLMA grade rules, stating that the primary manufacturers in the area sell eastern white pine based on NeLMA standards, so that is what they buy.

Manufacturers in the Lake State and Mid-Atlantic regions were much less likely to use NeLMA grading rules. Many primary manufacturers in the Mid-Atlantic region saw EWP as log run, and their customers are generally satisfied with that. Many log-home manufacturers in the Mid-Atlantic region used Timber Products Inspection (TPI) graders to inspect their structural timbers. A few interviewees in the Lake State region reported following NeLMA grade rules, and these tended to be the larger primary manufacturers. They reported that many customers request NeLMA lumber grades

because they are more familiar with them, although many of these customers were brokers who may be re-selling the material to New England.

Another commonly used grading agency in the Lake States was the Western Wood Products Association (WWPA). Many secondary manufacturers in the Lake State region use these grades for EWP because they also apply to any other white pine substitute, such as ponderosa pine and western white pine. This made it easier to refer to all these species as "white pine", and grade them all with the same system. However, these manufacturers often did not recognize these grades as coming from the WWPA, and reported using the grades only because their suppliers use them.

Opinions on Regional Lumber Quality

When asked about their opinions on raw material quality coming from the three regions in the study, nearly all primary manufacturers responded that they do not buy logs outside of a 50 to 150 mile radius because shipping any further is cost prohibitive. Sawmills had little to no experience with logs from outside of their supply range. This validates findings in earlier sections of this research showing that inter-regional trade of EWP logs is extremely limited. However, most manufacturers had strong opinions about the raw material coming from the various regions in their local area. Sawn lumber and finished products were more likely to travel larger distances, and so some mills had experience with such products from other regions. A common theme among respondents was that the raw material itself is not different from region to region, but the level of processing capability and expertise made a significant difference in lumber quality coming from the three regions.

Most mills in all regions reported that New England generally had the most sophisticated mills and the highest production capability of the three regions, and that generally led to a better-manufactured product. Mills in New England reported that they did not buy EWP products from other regions because they had such a large supply in their area that there was no reason to go elsewhere. Many Mid-Atlantic and Lake State region mills reported buying EWP products from New England, but this was primarily to cover material shortages or if an exceptional price was offered. Quality was not a main reason for buying EWP from New England, and both primary and secondary manufacturers in the Lake States and Mid-Atlantic regions were satisfied with the quality of EWP coming from their own regions.

Most of the respondents that reported having experience with lumber from regions outside their own stated that New England EWP tends to have a large quantity of large red (tight) knots, which most users do not consider a defect. In fact, many secondary users consider red knots to be desirable, such as log home, paneling, and siding manufacturers. The Lake States tend to have larger, older stands of unmanaged EWP, which produces large amounts of clear wood towards the outside of the log but has a high content of black (loose) knots. Eastern white pine from the Mid-Atlantic region is reportedly faster grown, and as such has more clear distances between knots, and most knots are sound. However, staining is a problem with EWP, especially in the summer, and many secondary respondents stated that the New England region seems to have the best drying practices for keeping stain to a minimum.

Interviewees in the New England region stated that the quality of raw materials in their area has generally increased or at least remained consistent during the past 10 to 15

years. Many respondents claimed that the annual growth of EWP is outpacing the harvest in New England, and that the average log diameter has remained consistent. The Mid-Atlantic region reported a slight decrease in log quality, with decreasing lumber widths and less availability in general. However, this decrease has been small in comparison with hardwoods according to Mid-Atlantic respondents. Lake State respondents reported EWP quality remaining about the same, if not increasing slightly due to some plantation efforts and low-quality thinning.

Future Production Estimates

When asked about their plans for EWP production during the next 5 years, most mills in the New England region reported planning to increase production or at least stay the same. Many reported that they are selling all they can produce and are only limited by their ability to get raw materials, while some mills are planning to increase production to meet a growing demand. Other mills stated that they are comfortable selling their current production, and they could easily sell more but were not willing to go into debt to buy new equipment that would be necessary to increase production. The Mid-Atlantic region was even more optimistic about production volumes, with every interviewee reporting plans to increase manufacture of EWP products. The only exception to this was a West Virginia sawmill, which responded that it would easily increase production if it could find more EWP logs, but production may decrease in the near future due to scarce supply. The Lake State region had the same general comments as the other two regions, reporting plenty of market demand for EWP products with a lack of logs preventing further production. These results validate earlier findings from the questionnaire portion

of this research, which identified "inconsistent supply" as a leading cause of difficulty in obtaining EWP raw material.

This lack of EWP raw material was a common theme across all three regions, and the cause seems to be a shortage of loggers who are willing and able to harvest EWP. Most mills reported that there is a large amount of EWP in the forests, but there are not enough loggers to harvest it. This is also influenced by weather conditions that may prevent loggers from getting into the forest. Log price is likely a contributing factor as well, but none of the interviewees mentioned this. For the most part, respondents in the New England and Lake State regions reported that EWP harvested in their area is utilized for maximum value, with very little potential sawtimber going to paper mills or left in the woods after a harvest. Sawmills believed that loggers know they can sell the logs above about 8 inches as sawtimber, and most loggers in their area would not consider selling those logs to pulp mills. The exception to this was in the Mid-Atlantic region, where many sawmills suspected that loggers were more concerned with high-dollar hardwoods than EWP. Interviewees stated that some loggers may not realize that a market for EWP logs exists in the Mid-Atlantic area, and so some EWP logs may be left in the woods when harvesting other species. Some sawtimber may also be going to pulp mills, especially when harvesting nearby a pulping operation. Although this research did not include loggers in the sample frame, these interview results suggests that the loggers may play a key role in determining how effectively EWP is utilized in any particular area.

Effect of Imported Species

Responses were varied when industry representatives were asked how imported species had impacted their operation. Most primary mills reported that the presence of

radiata pine in the market has had an extremely negative effect on their ability to market EWP, while others had never heard of it. New England sawmills were the most aware of radiata pine's presence, as almost all primary manufacturers in this region reported a loss of market share in the past 5 to 10 years. The exception to this was the smaller mills that maintain a local customer base which makes them less exposed to the effects of imported species. Secondary manufacturers in the New England area were generally indifferent to radiata pine, and said that they would use it if it were available for a good price and consistent quality but so far they have not seen the need to switch.

Respondents from the primary industry in the Mid-Atlantic region also reported having lost market share to radiata pine, but the impact did not seem as large as in New England. This may be due to the fact that sawmills in the Mid-Atlantic usually saw many different species, and so the mills are not depending as heavily on any one species. Mid-Atlantic sawmills also seemed more willing to adapt radiata pine lumber as a raw material for feeding a secondary process than their New England counterparts. This may be due to the strong historical association given to EWP in New England, or due to low availability of EWP mentioned earlier in the interview. A few interviewees in the Mid-Atlantic region stated that they would be willing to buy radiata pine lumber given consistent supply and comparable price to EWP. While many Mid-Atlantic mills also reported that radiata pine has had a negative effect on their operation, some reported that it had helped keep log prices down, and helped provide raw material in times when EWP was not available. Most secondary manufacturers in the Mid-Atlantic region said that they have no problem using radiata pine, but in most cases would prefer EWP. However, one window and door manufacturer in Virginia stated that they have used all radiata pine

for the past eight years and wouldn't consider using EWP because they would not be able to find it in large enough quantities.

The Lake States seemed to be the least affected by imported species such as radiata pine. Many sawmills stated that import species have had no impact on their business, and some even said that they had never heard of radiata pine. This response was similar among secondary manufacturers, many of whom said that radiata pine was not available in their markets and that EWP currently satisfied their needs. This absence of radiata pine in the Lake State market may be caused by prohibitive shipping costs that are not as expensive in other coastal regions, and this is an advantage to samills in that region.

To contrast these results with the results in the survey, the general theme of about half of all respondents stating that they had no opinion about the effect of radiata pine on their industry was also found during the personal interviews. Few interviewees reported radiata pine having a positive impact on their operation, which supports and validates survey results. However, it seemed as if many more people reported having been impacted negatively by radiata pine imports. This suggests that radiata pine may have had a larger impact than was predicted in the survey portion of this research.

In an effort to understand what the industry thinks about EWP as a raw material in comparison to imported species such as radiata pine, a question was included in the interview asking respondents to mention radiata pine's largest advantages and disadvantages, followed by EWP's largest advantages and disadvantages. First, radiata pine has traditionally been cheaper than EWP, and it often has a higher percentage of clear wood due to good management practices on plantations. Radiata pine is also said to

have fewer knots than EWP, and there is less of a problem with knots bleeding through paint. Other material attribute advantages are that it is relatively easy to machine, and it has very little problem with fiber tear-out. Radiata is also readily available in large quantities, although the supply is reportedly inconsistent at times. Some mills also said that radiata pine is often environmentally certified because it comes from certified plantations that are managed for sustainability. Additionally, radiata pine is available as S4S lumber and pre-manufactured mouldings in many varieties, which allows some secondary operations such as window and door manufacturers in the US to save money on labor. Finally, radiata pine is stronger on a volume basis and can be used for structural purposes where EWP is traditionally not.

The main disadvantage for radiata pine is its problems maintaining consistent supplies. Secondary manufacturers do not want to sever ties with local EWP suppliers because they cannot depend on regular shipments of radiata pine. It is also more difficult to order than EWP and takes more time to deliver, with lead times of between 1 and 2 months as opposed to 1 to 3 weeks for EWP, depending on the mill. Some mills reported that radiata pine is not dried very well in its country of origin, and can deform in the humid overseas shipping process. If not dried properly, radiata pine can also develop a stain, often called "coffee stain" or "brown stain". This stain lies just below the surface and becomes visible only after further processing. Other mills mentioned that radiata pine does not have the same distinct character as EWP, with larger growth rings and a less attractive grain pattern and knot structure. One moulding manufacturer said that changing raw material would require educating shop workers and customers about the new wood species, and there would have to be significant incentives to change to justify

that effort. Price can also be a disadvantage, as radiata pine is occasionally more expensive than EWP.

In New England, eastern white pine has a unique advantage of being considered a "historical" wood species of that area. The inhabitants of that region seem to prefer EWP to almost any other wood for almost all decorative applications. Across all regions, EWP was desired for its bright color and machinability. It is said to be extremely dimensionally stable, and resists chipping and other fiber tear-out. As mentioned earlier, EWP can be delivered much quicker to mills in the US than radiata pine, and is reportedly available in wider widths. Eastern white pine also seems to have relatively steady markets, and no sawmill in any region reported having a problem selling all the EWP that they could produce. Another large factor for both primary and secondary manufactures in all regions was the fact that EWP is a locally grown and processed product, and most mills reported that they liked the fact that using EWP supported local industry. Having a local supply also allowed mills to keep tighter control over quality throughout the manufacturing and drying processes, which most respondents believed to be a significant advantage. This trend validates earlier findings from the mail survey portion of this research, which showed that EWP's support of local industry was one of the most important attributes for EWP products.

One of the largest disadvantages for EWP was how quickly logs develop stain fungi. During the summer, logs will begin to stain after about two weeks on the yard. This means that many sawmills struggle to maintain no more than two weeks of log inventory during the summer months. Many mills solved this problem by sprinkling their logs with water, but this is an expensive option that is not always feasible. Staining is

less of a problem during the winter months, when logs can be on the yard in excess of 5 weeks before staining begins. Some mills also reported that EWP does not produce many long clear lengths, and its softness makes it prone to mechanical damage. As mentioned earlier, EWP is not as strong as radiata pine and is not typically recommended for structural purposes, with the exception of timber frame construction and full-log log homes. Knot content is high in EWP, although knots tend to be sound and many manufacturers find this feature attractive. Finally, as mentioned earlier, many mills in the Mid-Atlantic region are having difficulty locating EWP logs, and this shortage of raw material is a large disincentive to add EWP to their species mix.

Service Characteristics and New Markets

When interviewees were asked which service characteristics they felt were the most important to the sale of EWP products, the two most commonly mentioned items were consistent quality and on-time delivery. This general theme was seen among both primary and secondary manufacturers, although these comments did not exactly match the results of a previous mail survey section of this research which showed that a good reputation was the overall highest rated service characteristic based on importance. Having a good reputation was not mentioned once during the interviews as an important service characteristic. This was most likely due to respondents not considering a good reputation as a service that they provide to their customers, even though they may depend heavily on reputation to ensure they buy the products they need from the sources that can best provide them. However, on-time delivery was rated very highly by secondary manufacturers and relatively high by primary manufacturers in the mail survey, and the interview comments validate that result.

Other services mentioned frequently were the ability to custom dry to specific moisture contents and a willingness to hold inventory. Listening to customers was also mentioned frequently, which would hopefully lead to discovering new customer needs and adapting to them. Some mills offered special packaging and product guarantees, while some of the log home manufacturers offered home design services that were a major advantage to selling their products. Maintaining a good business relationship was mentioned, as well as being honest with customers and giving discounts for prompt payment.

Many respondents reported that their company was either increasing production of current products or entering new markets for EWP. The most frequently mentioned new market being considered by both primary and secondary manufacturers of EWP was the log home industry. All three regions echoed the opinion that the log home market is growing quickly and offering the most promising new opportunities to sell EWP products. Companies entering this market are usually producing thicker lumber for log siding profilers, or adding machinery to do the log siding profiling themselves. Some other markets being considered are selling green lumber to pallet manufacturers, producing wall paneling products, and adding moulding/millwork equipment to a sawmill to capture more value from raw materials. Some log home manufacturers had added production lines for railing and porch posts to supply their construction crews, while others were opening regional sales offices in new markets across the US. Log home companies typically manufacture their homes centrally at one production facility and then ship nationwide from that location, while sales are done through regional branch offices. However, many companies were comfortable producing at their current levels and were

resisting market demand to grow bigger by entering new markets or increasing production. The main concern among these manufacturers was that increasing debt loads would decrease their flexibility and alter their business model by forcing them to sell higher quantities of lumber to repay the debt.

One final trend that seemed prevalent was the use of brokers to buy and sell EWP production. Brokering lumber was a common phenomenon among both primary and secondary manufacturers of EWP. In this case, an EWP broker would buy lumber from manufacturers and sell it to customers who are looking for a raw material source. Both parties pay the broker a certain commission, but it is not in a broker's best interest to reveal who their suppliers or their customers are because then they could deal directly and there would be no further need for a broker. This lack of knowledge concerning raw material origin could be a reason why so few secondary manufacturers have opinions about the quality of lumber coming from the three different regions. Someone buying from a broker would never know where their lumber is coming from.

Conclusions

This research determined that a bias for eastern white pine (EWP) lumber coming from the New England region may exist among manufacturers in the New England and Mid-Atlantic regions. No such bias is believed to exist among manufacturers in the Lake State region. It was also found that manufacturers in the Mid-Atlantic region may have a negative bias towards EWP lumber coming from the Mid-Atlantic and Lake State regions. However, most respondents commented that the lumber groups depicted in the photos looked extremely similar, and that the boards were all of generally high quality.

The New England region used the Northeastern Lumber Manufacturers Association (NeLMA) grade rules almost exclusively, while the Mid-Atlantic region tended to sell mostly log run material and the Lake States used a mixture of NeLMA grades, Western Wood Products Association (WWPA) grades, and customer specified grades. Nearly all sawmills stated that they did not buy logs from outside of a 150 mile radius because of shipping costs, but sawn lumber and other downstream products were more likely to travel between regions. While some secondary manufacturers in other regions reported buying EWP products from New England, the majority said that there was no major raw material difference between regions. Overall, respondents from all regions stated that the quality of EWP has increased or at least remained constant during the past 10-15 years.

Most respondents stated that they either plan to increase production during the next five years, or at least remain constant. No respondents reported having difficulty marketing their EWP products, and any decreases in production were due to shortages in raw material supply. All regions responded that there is a shortage of EWP logs, but this was not due to shortages in the forest but rather a shortage of loggers available to harvest EWP. In general, most respondents stated that EWP sawtimbers are utilized well, and that loggers know there is a better market for them than pulp chips.

New England seems to have been the region most affected by imported species such as radiata pine, as many mills have reported losing market share to it. Mills in the Mid-Atlantic were also affected, but to a lesser degree than in New England, and mills in the Lake States seemed almost unaffected by radiata pine. Some EWP sawmills in the Lake States had never even heard of radiata pine. Radiata pine's biggest advantage

seemed to be its competitive price, and the largest disadvantage was its unreliable supply. Eastern white pine's biggest advantage in New England was its historical attachment in that area, and all three regions stated that they liked that it was locally manufactured and supported local industry. The biggest disadvantages for EWP was its tendency to stain while in the log yard, as well as being occasionally difficult to find in large enough quantities (both logs for sawmills and lumber for secondary processes).

The most important service characteristics for both primary and secondary manufacturers of EWP were consistent quality and on-time delivery. Other services offered were special drying, special packaging, listening to customer input, and maintaining a good business relationship.

Most manufacturers reported that they would be increasing production during the next five years, or at least remaining the same. All respondents reported that they had no difficulty selling the EWP materials they currently produced, and most of the companies reporting no growth stated that the decision to remain the same size was made only because they did not want to acquire more debt. The most frequently mentioned new market that companies were considering to enter was the log home industry, and this was true across all regions. Another trend that occurred in all regions was that of brokering lumber, where a broker acts as an intermediary between buyer and seller. When companies go through a lumber broker they do not know where the lumber is actually shipped to or comes from, and this may be one reason why few manufacturers have opinions about differences in raw material quality coming from different regions: they may not know where their lumber comes from.

Literature Cited

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Chapter 6: Research Summary

Eastern white pine represents a large raw material source for the wood industry in the Eastern US, but few research efforts have been conducted to assess markets for this species to date. This has lead to a relative lack of knowledge about how this species is processed and marketed, and how that differs between the main regions in which it is grown. It had been suggested prior to this research that eastern white pine (EWP) is underutilized in certain regions of the US, where supplies are plentiful but largely ignored by the industry. It was proposed that EWP in these regions may be used more for lower-value products such as pulp chips, while it has the potential to be used for much higher-value products such as molding/millwork, paneling, siding, log homes, etc.. The possibility also existed that some mills may have been bypassing EWP supplies in their own regions to buy what they perceived to be higher quality EWP raw materials in other regions. Imports such as radiata pine also posed a threat to EWP markets.

This research was aimed at answering these questions by surveying primary and secondary manufacturers of EWP in three main regions of the US where it is grown and supports an industry: New England, Mid-Atlantic, and Lake States. This survey was followed by personal interviews with industry representatives to validate and expand upon the results found in the survery. The objectives of these research efforts were:

1. Identify differences in eastern white pine market characteristics between New England, Mid-Atlantic, and Lake State regions of the US, as they pertain to both primary and secondary industries.

2. Identify differences between primary and secondary manufacturers in terms of desired product attributes that may impede the efficient marketing of eastern white pine lumber.

General Conclusions

In addressing the two primary objectives, this research was able to identify a few key themes that have broad overall implications for the EWP industry. The first and most promising of these is that the market for EWP products appears to be in a current state of strong growth among both primary and secondary manufacturers. This suggests that EWP is far from an undesirable or ignored species within the regions included in this study. While the New England region still produces and markets far more EWP than other regions, the fastest growth rate in primary production is projected in the Lake States (10.7% next 5 yrs), while the fastest secondary growth is projected in the Mid-Atlantic region (25.6% next 5 yrs). These estimated growth rates indicate that the market size is expanding, which presents opportunities for manufacturers at all levels to capture additional market share.

Strong market growth leads the discussion to the issue of raw material utilization. More specifically, if so much EWP raw material is reportedly growing in all three regions, and demand appears to be strong and growing for EWP products, then why is it not fully utilized in the three regions? It had been suggested that sawmills may have been buying logs from outside of their own region, but this research has determined that this is not the case. Interview results indicated that no sawmills were willing to ship logs further than 150 miles. However, inter-regional trade of EWP lumber and other downstream secondary products was more common than with logs, with secondary manufacturers in

the Mid-Atlantic region reporting more than 30% of their EWP raw materials coming from other regions, and 16% of the raw material for secondary manufacturers in the Lake States coming from other regions.

This inter-regional trade of raw materials for the secondary industry is likely one factor leading to underutilization of local EWP growing stocks in Mid-Atlantic and Lake State regions. However, survey results suggest that this is not caused by perceived differences in raw material quality. The majority of primary and secondary manufacturers reported that they do not believe that a quality difference exists between raw material (both logs and lumber) coming from the three regions. Rather, the most frequent reason given for buying EWP raw materials from other regions was a lack of consistent supply and other general availability issues. This response does not seem to make sense given that such large quantities of EWP are reportedly being underutilized in the forest. Indeed, when primary manufacturers were asked if they believed that ample supplies of EWP were available in the forest, the answer was yes almost without exception. Instead, the limiting factor was often having a sufficient amount of log suppliers who could harvest and deliver the logs. Many sawmills reported that they would be able to increase production overnight and easily sell more EWP products if they could get the logs. This is an interesting theme, because if a true shortage existed for EWP logs then prices should theoretically increase until there would be enough incentive for loggers to harvest more logs. This would suggest that sawmills are simply not willing to pay more for EWP logs. Asking the loggers about this situation would likely provide further answers to this question; unfortunately, loggers were not included in this study.

Respondents reported that they did not believe that a quality difference existed in EWP grown in each region, and this sentiment was repeated during industry interviews. However, many manufacturers (both primary and secondary) believed that mills in the New England region were more able to produce higher quality lumber than in other regions. Possible causes given for this were that they had more experience and technology for processing EWP and this may be due New England's long history of producing EWP. Many respondents also mentioned that sawmills in New England try to get more value out of their logs by turning logs and sawing for grade, and they have the know-how to do this better than other regions in general. They also benefit from economies of scale, as many mills in New England are dedicated to the manufacture of EWP lumber and other secondary products. Another factor making them unique is the presence of an industry association dedicated primarily to manufacturers of EWP (NeLMA). With a common grading system and the ability to set quality standards across the entire region, as well as an opportunity to share best practices and unite and organize the industry, the presence of an association like NeLMA is a distinct advantage for EWP manufacturers in New England. Without such a presence, it would be difficult for other regions to replicate this level of success.

However, it must be noted that all the advantages held by the New England region can be emulated in other regions, and mills in all three regions will have ample opportunity to benefit from the predicted increase in EWP demand. Some sawmills in the Lake State region are already NeLMA certified and ship products as far as Tennessee and Virginia. The main factor keeping EWP manufacturers in Mid-Atlantic and Lake

State regions from increasing production is related to log availability, and this issue will have to be solved before the EWP can be better utilized in any region.

Another general theme discovered during this research was the lack of impact that imported species have had on EWP markets. When asked about the effect that imported species have had on them, the majority of both primary and secondary EWP producers responded that it had no effect on their operations. This result was surprising, and suggests that radiata pine either has not had the impact on markets for EWP that were previously thought, or that many companies are unaware of how much market share they have lost to this new imported species. Whatever the cause, New England mills reported having been impacted by radiata pine more than any other region. This result is logical, because many mills in New England focus solely on EWP, and so are naturally affected more by disruptions in this market.

Industry Implications

Primary Manufacturers (Sawmills)

Sawmills in the New England region have many advantages that benefit them, such as quantities of scale, more investment in sophisticated technology, proximity to and support from the EWP-focused trade association NeLMA, and experience processing EWP material. Another key advantage for sawmills in the New England region is that EWP is a traditional species there and is used more frequently and for more applications than is common in other regions (eg., flooring). However, this advantage will not be able to prevent loss of market share to lower-priced imported species during the long run, so EWP sawmills in New England may want to consider focusing on other advantages for sustained growth.

Sawmills in all regions will be able to benefit from the projected increases in demand for EWP, but particular attention should be paid to the secondary market in the Mid-Atlantic with an estimated 25.6% growth in demand for EWP during the next 5 years. Sawmills located in this region will have the best chance to capitalize on this demand, but if they cannot increase production to meet this demand then other regions will be able to supply the needed raw material. Therefore, sawmills in Lake State and New England regions should also consider entering the Mid-Atlantic market. If mills in the Mid-Atlantic region cannot find sufficient supplies of EWP, then secondary manufacturers will most likely turn to imported species.

Primary manufacturers reported that they believe that color and machinability are the two most important characteristics of EWP that give it an advantage over substitute species such as ponderosa pine and radiata pine. However, secondary manufacturers reported that the most important characteristics to them are that buying EWP supports local industry and it is easier to order than other substitute species. This means that sawmills may want to focus more on the fact their material is locally grown and processed, and that their proximity makes the ordering process less complicated and more reliable. Additionally, analysis showed that primary manufacturers believed that the machinability, product range, and rustic look of EWP were valued by their customers significantly higher than they actually were. This is not to say that these characteristics were not important at all, but sawmills may have overestimated their value to customers.

An analysis of services showed that primary manufacturers believed that a good reputation, understanding customer needs, and handling special orders were the most important to their customers buying EWP lumber. Secondary manufacturers responded

that the most important service characteristics were keeping prices consistent and on-time delivery, followed by having a good reputation. Additionally, sawmills significantly underestimated how highly their EWP customers value on-time delivery and consistent prices. This is strong evidence that sawmills in all regions would benefit from increased efforts to offer on-time delivery and consistent prices, and these would likely be services that secondary manufacturers would be willing to pay for.

Secondary Manufacturers

In general, secondary manufacturers have less vested interest in using EWP than primary manufactures, and certainly less than loggers or landowners. From their perspective, a product must be produced and a raw material species must be used to produce it with. While some secondary mills in New England may insist on EWP for traditional purposes, the majority of mills will use whatever creates the most value for them as a company. Therefore, primary manufacturers of EWP who want to maintain a competitive advantage should be evaluating how they can create more value for their customers in the secondary industry.

The problem with this strategy is that there do not seem to be as many producers of EWP in Lake State and Mid-Atlantic regions as would be expected given this strong demand. Many secondary manufacturers in the Mid-Atlantic and Lake State regions reported that they could not find sufficient quantities of EWP lumber in their region, and that they had on occasion bought products from New England when local supplies became short. The few sawmills in these two regions sawing EWP have very little competition and EWP lumber supplies are consequently so low that many secondary manufacturers do not even realize that EWP is a viable raw material. This seems to

suggest that there is a breakdown between supply and demand somewhere in the value chain; high demand should lead to increased prices for EWP, and thus increased production. However, interviews indicated that prices for EWP have already gone up, so it is possible that production is just now beginning to increase to meet that demand. The EWP market growth estimates support that argument. Unfortunately, this issue of supply not meeting demand despite ample forest inventory was not anticipated prior to beginning this research and will require further study.

Aside from availability issues, secondary manufacturers reported that radiata pine's biggest advantages over EWP were having a lower price, fewer defects, and increased strength. However, many interviewees stated that EWP is not always more expensive than radiata pine, which means that the most price sensitive customers are still potential EWP users. Having fewer defects and increased strength are not easily changeable in the short run, so customers buying radiata pine for these characteristics are not likely to return to EWP.

Survey results revealed that secondary mills in the Lake State region used EWP for 8% of their total production on average, compared with between 50% and 80% for Mid-Atlantic and New England regions, respectively. This implies that EWP sawmills trying to enter this market will have to deal with many smaller users of EWP which may make market penetration slow and costly. The secondary New England market has many large users of EWP and predicts a larger increase in market size, but this market is also relatively saturated. In comparison, the Mid-Atlantic market currently seems to be the most promising for new entrants with more than 25% predicted growth in secondary demand for EWP during the next 5 years and a low saturation level. Given this scenario,

the Mid-Atlantic region appears to be the most promising secondary market for sawmills trying to capture more market share, followed by New England and then the Lake States.

The survey also compared four separate secondary markets for EWP, and the two fastest growing markets were Moulding/Millwork and Log Home/Timberframe, with 24.5% and 22.6% growth estimated during the next 5 years. These were also the two industries that most interviewees were considering entering, so there is likely to be competition in these markets. However, these markets most likely hold the most opportunities for sawmills trying to expand product range or production.

Suggestions for Future Research: USDA Forest Service and NeLMA

Research efforts during this project have uncovered a good deal of information about eastern white pine's markets, both primary and secondary, and how they are different between regions. However, much remains to be learned about how to better utilize this abundant raw material. While talking to industry representatives, it became clear that one large factor was not included in this research, and that was the loggers. Many sawmills claimed that they could not locate sufficient quantities of EWP logs to feed their operations, and could easily process and sell more if they could find the logs. Additionally, sawmill representatives usually did not know why loggers were not bringing in more EWP. It would be interesting to hear from loggers about their experience with EWP, and what their situation is concerning this versus other species.

Another area of future research that would benefit utilization of EWP would be to do a profitability analysis on manufacturing EWP as compared to other species. Sawmills had very different opinions about the profitability of manufacturing EWP, even within the same region. Some mills in the Mid-Atlantic and Lake States claimed that

EWP earns much less money per board foot than other hardwood species, but this can be offset by quicker manufacturing time, less difficulty handling, and shorter drying time for EWP. Some sawmills also stated that loggers may not believe that they can make as much money with EWP as other hardwoods, but they do not consider how many more EWP logs fit in a trailer load than the more irregular hardwood logs. This was all essentially speculation, but quantifying and comparing some of the advantages and disadvantages to manufacturing EWP would provide a clearer picture of how EWP compares to other hardwood species in profitability.

The two issues of supply being restricted by loggers' preference for certain species and the profitability of sawing EWP certainly need further attention, and such efforts could be aided by governmental organizations such as the USDA Forest Service. If resources could be directed at finding out more about the profitability of sawing EWP, then this knowledge could be disseminated to logging personnel in critical areas where EWP growing stocks are abundant. Logging crews would have to be informed about where the markets are for EWP logs, and how much value they can expect from harvesting this species versus other hardwoods. Many industry representatives in New England reported that the higher grades of EWP can well exceed the prices of most hardwoods, so there is evidence to suggest that EWP has competitive profit potential. If loggers could be convinced of this potential, then increased harvests and better utilization of EWP would most likely follow.

In an opposite vein, the results of this research seem to indicate that studying actual lumber quality in the three regions would not be a worthwhile effort. All sources indicate that there is little difference in actual EWP lumber quality between the three

regions, and any difference that may exist is insignificant. Industry representatives reported that different regions may tend to produce different lumber characteristics, but the material is equally saleable. Shipping costs are the main factor keeping raw material from traveling between regions, not raw material quality. However, it seems as if large differences exist in EWP log quality and availability within much more local areas, e.g. within 150 to 200 miles. With shipping costs for logs playing such a large role in obtaining raw materials, and with so many sawmills reporting that availability is the main reason for them to not saw more EWP, it may be helpful to conduct more local studies of EWP quality and availability to locate ideal locations for EWP sawmills to operate.

One final area that could benefit the utilization of EWP has to do with the role played by industry associations such as NeLMA. It may be beneficial to have a more focused effort on either organizing EWP mills in the Lake State and Mid-Atlantic regions, or attempting to extend NeLMA's reach to better cover those regions. However, it would first have to be determined if there is sufficient industry interest from those regions, and if NeLMA would be able and/or willing to expand its constituency. It is possible that current NeLMA members may see an expansion as benefiting competition in other regions. This concern would not be unfounded, but the benefits of developing markets for EWP in other regions would likely outweigh the cost to New England sawmills. NeLMA broadening their reach in Mid-Atlantic and Lake State regions would not only facilitate the common use of NeLMA grades across regions, but also increase EWP's presence in secondary markets that are currently untapped by any region. The results of this study show that inter-regional transport of secondary products such as moulding, paneling, and siding can be done profitably. NeLMA extending its reach

would be able to open up these secondary markets to its current membership base, leading to a net benefit for the entire EWP industry.

Limitations to the Study

As with all survey research, there is potential for bias to be introduced into the experiment from various sources. Only those who volunteer to fill out and return the survey are counted in the data sample, and therefore a certain amount of self-selection bias is introduced. This is accounted for by the non-response tests, but this cannot cure the problem completely. Another limitation was that it was difficult to locate directories that offered information about species use, and so the survey was not able to focus as specifically on the population as would have been ideal. This also made it impossible to make estimates of total mill numbers in each region, which in turn meant that no valid estimates could be made of total industry production.

The lumber photograph comparison, while certainly a useful tool for beginning an interview and getting a conversation started, proved to be a rather weak indicator of bias. While the analysis showed that a bias was found, this result must be considered with a number of limitations in mind. First, to truly test for a pure bias for material from a certain region, the two groups of lumber must be of exactly the same quality. This could either be accomplished by 1) showing the same group of boards twice, but in different orientations with the expectation that the subject will not recognize them, or 2) comparing a large enough group of boards that the whole range of the grade can be held constant from photo to photo. EWP grades can only be represented by a larger group of 10 to 20 boards, so having only three boards limits the ability to maintain consistent quality. This point was made by nearly all industry representatives being interviewed.

Although every effort was made to obtain similar quality and grade lumber for the photographs, the boards from the Lake State region appeared to be of a lower quality than the boards from other regions, which adds bias to comparisons of the regions within each photo. This lower quality was primarily due to high black knot content, as opposed to the mostly tight red knots found in the other board groups. This quality difference was caused by the fact that grading rules are different in each region, and obtaining a true representation of a particular NeLMA grade is difficult without the assistance of a NeLMA trained grader.

Finally, since the data appeared to be skewed towards smaller-sized mills, it is possible that the results presented in this research are more descriptive of smaller mills than larger mills. This limitation does not change the overall conclusions of this research, but should be kept in mind when utilizing these results for further applications.

Appendix 1: Primary Questionnaire

1. Do you produce or use eastern white pine (EWP) in any part of your operation?

☐ No → STOP! Please fold the questionnaire along the dotted line found on the reverse side, tape together at the bottom, and return. Postage is prepaid!

☐ Yes → Please continue.

2. How would you classify your operation?

☐ Secondary processor (i.e., doors, flooring, moldings, dimension, windows, etc.)
→ STOP! Please fold the questionnaire along the dotted line found on the reverse side, tape together at the bottom, and return. Postage is prepaid!

☐ Primary processor (i.e., sawmill)
→ Please continue.

3. How does your mill grade eastern white pine lumber? Please check only one.

☐ NeLMA rules
☐ Using your own system
☐ By customer specification
☐ Other (please describe below)

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4. Is it difficult to obtain eastern white pine raw material?

☐ No
☐ Yes → If yes, then what is the cause? (Please check all that apply)

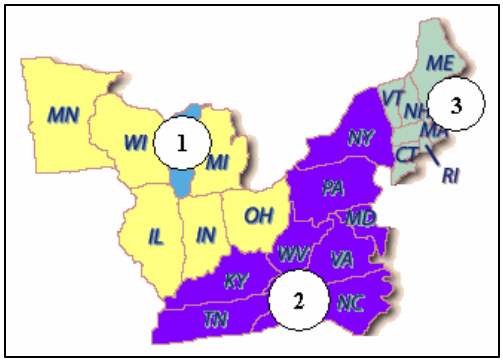
? Inconsistent raw material supply
? Quality of available raw material is too low
? Government harvest restrictions
? Poor weather conditions
? Physically inaccessible forestland
? High costs associated in dealing with many small land owners
? High costs associat ed with shipping raw material purchased from distant sources
? Other _____

_____

5. Using the map shown below, please indicate which region your company is located in. Then to the right of the map, please indicate howmuch of your company's eastern white pine (EWP) comes from each region, as a percentage of total volume purchased.

My company is located in . . .
(check the appropriate box)

Region 1 ☐
Region 2 ☐
Region 3 ☐



My company buys EWP from . . .
(fill in percentage)

Region 1 _____ %
Region 2 _____ %
Region 3 _____ %
Total = 100 %

6. Regarding the regions in question #5, if you buy eastern white pine raw material from a region other than the one you are located in, why do you buy eastern white pine from that region rather than the one you are located in? (Please check all that apply)

☐ No, I do NOT buy EWP raw material from outside of my region.

☐ Yes, I buy EWP raw material from other regions, because of . . .

- ? Higher quality
- ? More consistent supply
- ? Better selection of sawn EWP products
- ? Easier buying process
- ? Less occurrence of diseases such as white pine weevil and blister rust
- ? Wider EWP logs are available
- ? Mill is located on or near a regional border, and so any purchase from another region is unintentional
- ? Lower prices
- ? Higher growth ring count
- ? Larger distance between nodes
- ? More attractive color
- ? Better timber and forest management practices
- ? Other (please describe below)

_____

_____

7. In your opinion, please rate the three regions from question #5 in regard to the overall quality of eastern white pine raw material GROWN in each region. (1 = low quality, 7 = high quality)

Please rate ALL 3 REGIONS, to the best of your ability!

	Low Quality			Average Quality			High Quality
Region 1	1	2	3	4	5	6	7
Region 2	1	2	3	4	5	6	7
Region 3	1	2	3	4	5	6	7

8. Do you believe there are any physical differences between eastern white pine logs coming from the three regions in question #5?

☐ Yes ☐ No ☐ No opinion

If yes, then what is the difference?_____

_____

9. In your opinion, how much do you estimate your mill's eastern white pine production will change over the next 5 years? (Please choose only one)

☐ **Increase**, by _____% over the next 5 years.

☐ **Decrease**, by _____% over the next 5 years.

☐ **Remain constant.**

10. In your opinion, which US state produces the highest quality eastern white pine raw material?

US State: _____

11. Do you feel that the increasing imports of species such as radiata pine have had a positive or negative impact on your operation?

☐ Positive ☐ Negative ☐ No Effect

How?_____

_____

12. How important do you believe each of the following product attributes are to your customers when deciding to buy eastern white pine (EWP) lumber rather than a substitute species such as ponderosa pine or radiata pine? (Please circle your answer for each item, where 1 = low importance, 7 = high importance)

Product Attributes	Low Importance			Average Importance			High Importance
"Rustic" appearance of finished EWP	1	2	3	4	5	6	7
"Historical" appearance of EWP	1	2	3	4	5	6	7
EWP has a lower price	1	2	3	4	5	6	7
EWP offers a broader product range	1	2	3	4	5	6	7
EWP is easier to machine	1	2	3	4	5	6	7
EWP is better for painting	1	2	3	4	5	6	7
EWP is stronger	1	2	3	4	5	6	7
EWP is more durable	1	2	3	4	5	6	7
EWP has a more attractive color	1	2	3	4	5	6	7
EWP is more dimensionally stable	1	2	3	4	5	6	7
EWP is easier to order	1	2	3	4	5	6	7
EWP is delivered faster	1	2	3	4	5	6	7
EWP has fewer defects	1	2	3	4	5	6	7
Buying EWP supports local industry	1	2	3	4	5	6	7
Other (please describe below)	1	2	3	4	5	6	7

_____

13. Which of the following activities are you involved in to promote eastern white pine? (Please check all that apply)

☐ NeLMA certified

☐ Maintain a web page

☐ Produce promotional brochures for products

☐ Use and promote a brand name or logo other than NeLMA

--- You advertise in:

? trade journals ? newspapers

? radio ? television

? phone book ? other (please specify below)

_____

☐ Maintain a sales force

☐ Use the NeLMA logo to brand your lumber

☐ Member of industry association other than NeLMA (please indicate association)

_____

☐ Emphasize the quality of EWP in your region

☐ Sawmill represents itself at trade shows

☐ Emphasizing above average lumber quality

☐ Emphasizing above average customer service

☐ Other promotional or marketing activity (fill in)

_____

14. Please estimate your company's <u>total</u> (including all species) annual lumber production in board feet.

_____ board feet

15. Please indicate the volume of each species produced at this facility, as a percentage of total produced.

Eastern White Pine	_____%	Cherry	_____%
Ponderosa Pine	_____%	Yellow Poplar	_____%
Radiata Pine	_____%	Hickory	_____%
Scotts Pine	_____%	Ash	_____%
Red Oak	_____%	Beech	_____%
White Oak	_____%	Birch	_____%
Hard Maple	_____%	Basswood	_____%
Soft Maple	_____%	Mahogany	_____%
Other species	_____%		

Total = 100%

16. Please estimate the percentage of <u>your mill's eastern white pine</u> production volume that goes to each market. (Please answer all that apply)

Door manufacturers	_____ %	Cabinets	_____ %
Window manufacturers	_____ %	Flooring	_____ %
Molding / millwork	_____ %	Burial casket manufacturers	_____ %
Dimension	_____ %	Crate/container producers	_____ %
Retail	_____ %	Landscaping	_____ %
Furniture	_____ %	Other (Please describe)	_____ %
Log home/ Timber frame	_____ %	_____	

Total = 100%

17. Please rate the following service characteristics regarding the amount of effort and expense your company invests to provide each service to your customers buying <u>eastern white pine</u>. (Please circle your answer <u>for each item</u>, where 1 = little effort, 7 = high effort)

Service Characteristics	Little Effort			Average Effort			High Effort
Consistent on-time delivery	1	2	3	4	5	6	7
Maintaining a good reputation	1	2	3	4	5	6	7
Being available to customers	1	2	3	4	5	6	7
Solving customer problems	1	2	3	4	5	6	7
Handling special orders	1	2	3	4	5	6	7
Understanding customer needs	1	2	3	4	5	6	7
Maintaining a knowledgeable sales force	1	2	3	4	5	6	7
Keeping prices consistent	1	2	3	4	5	6	7
Offer a wide variety of products	1	2	3	4	5	6	7
Offer flexible payment agreements	1	2	3	4	5	6	7
Maintaining a strong business relationship	1	2	3	4	5	6	7
Offering "Just in Time" delivery	1	2	3	4	5	6	7

18. How frequently does your mill invest in technology upgrades or new equipment?

- ☐ More than 1 time a year
- ☐ Every 1 to 3 years
- ☐ Every 3 to 5 years
- ☐ Every 5 to 7 years
- ☐ Every 7 to 9 years
- ☐ Less than 1 time every 10 years

19. What were the total gross sales for your company (entire company, not just this production facility) in 2003?

- ☐ Less than $ 1,000,000
- ☐ $ 1,000,000 - $ 5,000,000
- ☐ $ 5,000,001 - $ 15,000,000
- ☐ $ 15,000,001 - $ 25,000,000
- ☐ $ 25,000,001 - $ 50,000,000
- ☐ Greater than $ 50,000,000

20. What is your title or name of your position?

- ☐ President
- ☐ Vice President
- ☐ Owner
- ☐ Manager
- ☐ Sales
- ☐ Other _____

21. Is your company a single facility, or does it operate multiple facilities?

- ☐ Single
- ☐ Multiple

22. How many full-time employees work for your company at this production facility?

- ☐ Fewer than 25
- ☐ 25 – 50
- ☐ 51 – 100
- ☐ 101 – 200
- ☐ 201 – 300
- ☐ 301 – 400
- ☐ Greater than 400

23. Does your company proactively search for new markets for eastern white pine products?

- ☐ Yes
- ☐ No

How ?_____

24. Is there anything else that you would like to share with us concerning eastern white pine that was not addressed in this survey?

_____

_____

_____

End of questionnaire! Please close, fold on dotted line found on the back, tape shut, and return in the mail. **Postage is prepaid!**

If you have any questions, please contact Paul Duvall at (540) 231-5876 or email pduvall@vt.edu.

Thank you!

☐ **Please check if you would you like to receive the complimentary results summary for this study.**

Appendix 2: Secondary Questionnaire

1. Do you use eastern white pine (EWP) in any part of your operation?

☐ No → STOP! Please fold the questionnaire along the dotted line found on the back cover, tape together at the bottom, and return. Postage is prepaid!

☐ Yes → Please continue.

2. How would you classify your operation?

☐ Primary processor (i.e., sawmill)
→ STOP! Please fold the questionnaire along the dotted line found on the back cover, tape together at the bottom, and return. Postage is prepaid!

☐ Secondary processor (i.e., doors, flooring, moldings, dimension, windows, etc.)
→ Please continue.

3. Which of the following manufacturing processes best describes your operation? (Please choose only one, which constitutes the majority of your operation!)

☐ Door manufacture
☐ Window manufacture
☐ Molding / Millwork
☐ Dimension
☐ Furniture
☐ Retail Lumber Sales
☐ Log home/ Timber frame
☐ Cabinets
☐ Flooring
☐ Burial casket manufacture
☐ Crate/container manufacture
☐ Landscaping
☐ Other (Please describe) _____

4. In your opinion, which of the following items influence you to buy eastern white pine from a particular supplier? (Please check all that apply)

☐ Sawmill is NeLMA certified
☐ Sawmill maintains a web page
☐ Sawmill produces promotional brochures for their products
☐ Use and promote a brand name or logo other than NeLMA

--- Sawmill advertises in:
? trade journals ? newspapers
? radio ? television
? phone book ? other (please specify below)

_____

☐ Maintain a sales force
☐ Use the NeLMA logo to brand your lumber
☐ Sawmill is a member of an industry association other than NeLMA (please indicate association)

_____

☐ Sawmill is from a favored geographical region
☐ Sawmill represents itself at trade shows
☐ Sawmill offers above average lumber quality
☐ Sawmill offers above average customer service
☐ Other promotional or marketing activity (fill in)

_____

5. In your opinion, how much do you estimate your mill's eastern white pine consumption will change over the next 5 years? (Please choose only one)

☐ **Increase**, by _____ % over the next 5 years.
☐ **Decrease**, by _____ % over the next 5 years.
☐ **Remain constant.**

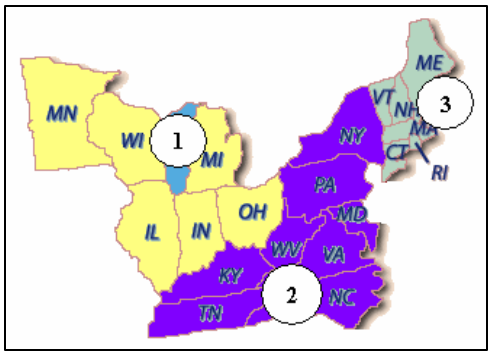
6. Using the map shown below, please indicate which region your company is located in. Then to the right of the map, please indicate how much of your company's eastern white pine (EWP) comes from each region, as a percentage of total volume purchased.

My company is located in . . .
(check the appropriate box)

Region 1 ☐

Region 2 ☐

Region 3 ☐



My company buys EWP pine from . . .
(fill in percentage)

Region 1 _____ %

Region 2 _____ %

Region 3 _____ %

Total = 100 %

7. Regarding the regions in question #6, if you buy eastern white pine raw material from a region other than the one you are located in, why do you buy eastern white pine from that region rather than the one you are located in? (Please check all that apply)

☐ No, I do NOT buy EWP raw material from outside of my region

☐ Yes, I buy EWP raw material from other regions, because of . . .

? Higher quality
? More consistent supply
? Better selection of sawn EWP products
? Easier buying process
? Less occurrence of diseases such as white pine weevil and blister rust
? Wider EWP logs are available
? Mill is located on or near a regional border, and so any purchase from another region is unintentional
? Lower prices
? Higher growth ring count
? Larger distance between nodes
? More attractive color
? Better timber and forest management practices
? Other (please describe below)

_____

_____

8. In your opinion, please rate the three regions from question #6 in regard to the overall quality of eastern white pine raw material GROWN in each region. (1 = low quality, 7 = high quality)

Please rate ALL 3 REGIONS, to the best of your ability!

	Low Quality			Average Quality			High Quality
Region 1	1	2	3	4	5	6	7
Region 2	1	2	3	4	5	6	7
Region 3	1	2	3	4	5	6	7

9. Do you believe there are any physical differences between eastern white pine lumber/cants coming from the three regions in question #6?

☐ Yes ☐ No ☐ No opinion

If yes, then what is the difference?_____

_____

10. Do you feel that the increasing imports of species such as radiata pine have had a positive or negative impact on your operation?

☐ Positive ☐ Negative ☐ No Effect

How?_____

_____

11. Please rate how much you agree or disagree with the following statements regarding radiata pine and eastern white pine, where 1=highly disagree, 7=highly agree. Please circle your answer for each statement!

Statement:	Highly Disagree			Neutral			Highly Agree
Radiata pine. . .							
. . . has lower price than EWP	1	2	3	4	5	6	7
. . . is easer to machine than EWP	1	2	3	4	5	6	7
. . . is stronger than EWP	1	2	3	4	5	6	7
. . . is easier to paint than EWP	1	2	3	4	5	6	7
. . . has fewer defects than EWP	1	2	3	4	5	6	7
. . . is delivered faster than EWP	1	2	3	4	5	6	7
. . . is easier to order than EWP	1	2	3	4	5	6	7
. . . is more dimensionally stable than EWP	1	2	3	4	5	6	7
. . . is (other, please describe)	1	2	3	4	5	6	7

_____.

12. How important are the following product attributes to your you when deciding to buy eastern white pine (EWP) products rather than a substitute species such as ponderosa pine or radiata pine? Please circle an answer for each item, where 1 = low importance, 7 = high importance.

Product Attribute	Low Importance			Average Importance			High Importance
"Rustic" appearance of finished EWP	1	2	3	4	5	6	7
"Historical" appearance of EWP	1	2	3	4	5	6	7
EWP has a lower price	1	2	3	4	5	6	7
EWP offers a broader product range	1	2	3	4	5	6	7
EWP is easier to machine	1	2	3	4	5	6	7
EWP is better for painting	1	2	3	4	5	6	7
EWP is stronger	1	2	3	4	5	6	7
EWP is more durable	1	2	3	4	5	6	7
EWP has more attractive color	1	2	3	4	5	6	7
EWP is more dimensionally stable	1	2	3	4	5	6	7
EWP is easier to order	1	2	3	4	5	6	7
EWP is delivered faster	1	2	3	4	5	6	7
EWP has fewer defects	1	2	3	4	5	6	7
Buying EWP supports local industry	1	2	3	4	5	6	7
Other (please describe below)	1	2	3	4	5	6	7

_____.

13. Please rate the following factors regarding how much your company values the following service characteristics from your eastern white pine lumber suppliers. Please circle your answer for each item, where 1 = of little value, 7 = of high value.

Service Characteristics	Little Value			Average Value			High Value
Consistent on-time delivery	1	2	3	4	5	6	7
Maintaining a good reputation	1	2	3	4	5	6	7
Being available to customers	1	2	3	4	5	6	7
Solving customer problems	1	2	3	4	5	6	7
Handling special orders	1	2	3	4	5	6	7
Understanding customer needs	1	2	3	4	5	6	7
Maintaining a knowledgeable sales force	1	2	3	4	5	6	7
Keeping prices consistent	1	2	3	4	5	6	7
Offer a wide variety of products	1	2	3	4	5	6	7
Offer flexible payment agreements	1	2	3	4	5	6	7
Maintaining a strong business relationship	1	2	3	4	5	6	7
Offering "Just in Time" delivery	1	2	3	4	5	6	7

14. Please estimate your company's total (including all species) annual lumber consumption in board feet.

_____ board feet

15. Please indicate the volume of each species used at this facility, as a percentage of total used.

Eastern White Pine	_____%	Cherry	_____%
Ponderosa Pine	_____%	Yellow Poplar	_____%
Radiata Pine	_____%	Hickory	_____%
Scotts Pine	_____%	Ash	_____%
Red Oak	_____%	Beech	_____%
White Oak	_____%	Birch	_____%
Hard Maple	_____%	Basswood	_____%
Soft Maple	_____%	Mahogany	_____%
Other species	_____%		

Total = 100%

16. In your opinion, which US state produces the highest quality eastern white pine raw material?

US State: _____

17. How frequently does your mill invest in technology upgrades or new equipment?

- ☐ More than 1 time a year
- ☐ Every 1 to 3 years
- ☐ Every 3 to 5 years
- ☐ Every 5 to 7 years
- ☐ Every 7 to 9 years
- ☐ Less than 1 time every 10 years

18. What were the total gross sales for your company (<u>entire company</u>, not just this production facility) in 2003?

- ☐ Less than $ 1,000,000
- ☐ $ 1,000,000 - $ 5,000,000
- ☐ $ 5,000,001 - $ 15,000,000
- ☐ $ 15,000,001 - $ 25,000,000
- ☐ $ 25,000,001 - $ 50,000,000
- ☐ Greater than $ 50,000,000

19. What is your title or name of your position?

- ☐ President
- ☐ Vice President
- ☐ Owner
- ☐ Manager
- ☐ Sales
- ☐ Other _____

20. Is your company a single facility, or does it operate multiple facilities?

- ☐ Single
- ☐ Multiple

21. How many full-time employees work for your company <u>at this production facility</u>?

- ☐ Fewer than 25
- ☐ 25 – 50
- ☐ 51 – 100
- ☐ 101 – 200
- ☐ 201 – 300
- ☐ 301 – 400
- ☐ Greater than 400

22. Does your company proactively search for new markets for eastern white pine products?

- ☐ Yes
- ☐ No

How ?_____

23. Is there anything else that you would like to share with us concerning eastern white pine that was not addressed in this survey?

_____

_____

_____

End of questionnaire! Please close, fold on dotted line found on the back, tape shut, and return in the mail. **Postage is prepaid!**

If you have any questions, please contact Paul Duvall at (540) 231-5876 or email pduvall@vt.edu.

<u>Thank you!</u>

☐ **Please check if you would you like to receive the complimentary results summary for this study.**

Appendix 3: Follow-Up Postcard

Dear Sir / Madame,

I need your Help! Recently, I sent you a copy of a questionnaire entitled, **"Assessing Eastern White Pine Markets in the Eastern US."** I am contacting you now to ask for your help by completing and returning the questionnaire. If you have already returned it, please accept my sincere appreciation. If you have not yet completed the questionnaire, please take a few minutes to do so.

I would also like to remind you of the **free summary report** that we are offering you for participating in the study. The report will summarize the major findings of the study that will help you better understand the markets for eastern white pine that are important to you. To receive this report, just check the box at the end of the questionnaire.

Remember, whether your operation is large or small, your answers are all important to us! Additionally, your participation in the study will be kept strictly confidential, and returning the questionnaire will remove your name from future mailings (except the results summary). If you have any questions, please contact me at (540) 231-5876 or fax: (540) 231-8868, or email: pduvall@vt.edu. And again, thank you for your help!

Sincerely,

Paul Duvall
Graduate Research Student, Virginia Tech
Forest Products Marketing

Appendix 4: Cover Letter

Center for Forest Products Marketing and Management
Thomas M. Brooks Forest Products Center
1650 Ramble Rd, Blacksburg, VA 24061-0503
(540) 231-5876 Fax:(540) 231-8868 Email: pduvall@vt.edu

March 26, 2004

From: Paul Duvall
Graduate Research Student, VA Tech
Brooks Forest Products Laboratory
1650 Ramble Rd.; Blacksburg, VA 24061-0503

To: Mr. Jose Cuervo
Special Reserve Log Cabin Co.
1800 Agaves Rd.; Gusano, NC 12345

Subject: Eastern White Pine Questionnaire

Dear Mr. Cuervo,

In an effort to better understand markets for eastern white pine, the Center for Forest Products Marketing and Management at Virginia Tech, in cooperation with the Northeastern Lumber Manufacturers Association (NeLMA), is collecting information on the critical issues your company faces in this area. The enclosed questionnaire has been developed to analyze and address those issues. We ask that you please take a few minutes to answer this short questionnaire. All responses are completely anonymous, and your participation will directly benefit white pine producers and users in the US.

In return for your help, we would like to offer you a **complementary result summary** of the study. If you would like to receive this complementary report, just check the appropriate box at the end of the questionnaire.

Your answers and suggestions are critical to the successful completion of this study, and as such I greatly appreciate your assistance. We thank you in advance for your participation, and if you have any questions please contact Paul Duvall at 540-231-5876 or email at pduvall@vt.edu.

Thank you for your help!

Paul Duvall
Graduate Research Student
Phone: (540) 231-5876 Fax: (540) 231-8868
Email: pduvall@vt.edu

Appendix 5: Unlabeled Lumber Photograph

Appendix 6: Labeled Lumber Photograph

Appendix 7: Interview Questions

Lumber Photograph Comparison

1. The three photographs you see are of eastern white pine lumber samples from three distinct regions within the US, labeled "3, 2, 1". Please rank the three photographs from 1 (best) to 3 (worst) on each attribute provided in the table below. Or, if you see no difference, please check the "No difference" box.

Attribute	Region 3	Region 2	Region 1	No difference
Color				
Color consistency				
Fewest defects				
Grain pattern				
Knot spacing				
Knot size				
Black/Loose knot content				
Other				
Other				
Overall				

Do you have any other comments on the three photographs?

2. The next set of photographs show a new group of eastern white pine boards from three designated regions: Lake States, Mid-Atlantic, and New England. Please provide the same ranking as before on the new set of eastern white pine board photographs.

Attribute	Lake States	Mid-Atlantic	New England	No difference
Color				
Color consistency				
Fewest defects				
Grain pattern				
Knot spacing				
Knot size				
Black/Loose knot content				
Other				
Other				
Overall				

Do you have any other comments on the three photographs?

Industry Interview Questions

1. How does your mill grade EWP lumber? Why?
   (Secondary: what grading system do your use when buying EWP lumber?)

2. What is your impression of the quality of EWP raw material coming from the three regions?

3. Do you believe that the quality of EWP has improved or declined over the past 10 – 15 years? Why?

4. Do you buy EWP from any of the other regions? If so, why?

5. How do you estimate your production/consumption of EWP will change over the next 5 years? Why? And the industry in general?

6. What is the largest factor preventing you from producing more EWP lumber? (Secondary: What is the largest factor preventing you from using more EWP lumber?)

7. Do you believe that large amounts of EWP in your area that could be used for lumber are used instead for pulp chips or other low-value products? If yes, then how could this material be used for higher-value products?

8. Do you use any imported species for applications where EWP could be used? What are they?

9. How have imported species such as radiata pine impacted your operation?
   - What are some of radiata pine's biggest advantages/disadvantages compared to EWP?

10. Alternatively, what are EWP's biggest advantages/disadvantages?

11. Which services do you feel are the most important to your EWP customers (or from your EWP suppliers)?

12. Have you entered or considered entering new markets for EWP? If so, what are they, and why? If not, then why?

Vita

Paul Mason Duvall was born to parents Paul K. Duvall and Linda D. Duvall on May 21, 1980, in Fairfax, VA. He was raised in Fairfax, VA, and attended W.T. Woodson High School until graduation in 1998. He began his undergraduate education at VA Tech in 1998, where he received his Bachelors of Science degree in Wood Science & Forest Products in 2002. Upon graduation Mr. Duvall continued his education by pursuing a Masters of Science degree at VA Tech, which he completed in 2004. Mr. Duvall will begin his career in sunny Florida as a sales associate with Sunbelt Forest Products.