C I N T R A F O R

Working Paper

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Material Use in the US Deck Market: An Assessment of the Market Potential for Alaska Yellow Cedar

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EXECUTIVE SUMMARY

The deck building industry is going through a period of rapid growth and dramatic change with respect to the types of materials available to build decks. A 2001 study by the Freedonia Group estimates that the demand for decking materials will increase by almost 20% between 2000 and 2010. To better understand material use and contractor preferences within the deck building industry, CINTRAFOR, with funding support from the USDA Forest Service Wood Utilization Lab in Sitka, AK) recently completed a survey of 205 deck builders and 213 home builders across the US. In particular, this research project was interested in documenting the current usage of Alaska Yellow Cedar (AYC) in residential decking, evaluating builders perceptions of AYC lumber as a decking material, assessing the potential for expanding the use of AYC in deck building and developing a set of strategic marketing recommendations to promote the expanded use of AYC in deck building. Refinement of the marketing recommendations should be considered once an accurate supply projection for AYC logs is available.

Survey Results

The deck building industry is dominated by small to medium-sized firms with over 63% of survey respondents indicating that their sales revenue was less than $1 million in 2003. In contrast, over 11% of deck builders generated sales revenue in excess of $5 million. The average deck builder constructed 93 decks with an average deck size of 456 square feet. Since the average construction cost for a new deck was $6,161, the average construction cost for a deck in the US was $13.51 per square foot. Approximately 45% of the construction cost was attributed to the deck surface while 33% was for the substructure and 21% was for accessories. Just over 40% of deck builder projects were new (first time) decks built on existing homes while 25% were new decks built on new homes and almost a third were replacement decks built on existing homes. However, the survey data clearly shows substantial differences in deck characteristics based on geographic location. For example, deck builders in the eastern US built more than twice as many decks per year as companies in the western US (126 decks vs. 52) although the average deck size was significantly higher in the west (530 square feet vs. 395 square feet). Despite this, the average construction cost was relatively similar between the regions ($15.04 per square foot in the west vs. $15.90)

Material use in the substructure was dominated by treated lumber with a market share of over 90%. Material use in deck surface applications was dominated by wood-plastic composite products followed by treated lumber and western red cedar. Finally, approximately 30% of deck accessories were built using wood-plastic composites and treated lumber while an additional 18% were built from western red cedar. Deck builders were also asked to indicate the relative importance of a variety of product attributes in their material specification decision. The most important attributes in the material specification process were long life, visual appearance, consistent material quality and product availability. In contrast, the lowest rated attribute was low price. In other words, deck builders base their material purchase decisions less on price, preferring to focus on material quality. This suggests that home owners are less price-sensitive in the purchase of a deck, preferring high quality, durability and ease of maintenance over low price.

Strategic Marketing Recommendations

Target Market

The results of the market research suggest that the target market for Alaska yellow cedar should be deck builders located on the US west coast, comprised of California, Oregon and Washington. The survey results show that decks built in this market are larger, more expensive and more likely to use naturally durable woods. The focus on deck builders is based on the fact that the demand for decking lumber in the repair and remodel market is expected to total 4.4 billion board feet in 2005 as compared to a demand of just 700 million board feet in the new construction market. In addition, our research results indicate that approximately 46% of the decks built on new homes are subcontracted out to deck builders. It is important to note that the survey results suggest that homeowners play a very important role in specifying decking material. For example, home builders indicated that home owners were responsible for specifying the decking material 30% of the time while deck contractors indicated that the homeowners specified the decking materials almost 50% of the time.

Product
The product offering should reflect a premium product strategy. Based on the survey results we recommend that lumber manufacturers in Alaska supply a family of products that includes decking lumber, deck joists and accessory products. This recommendation is based on the survey results showing that the use of naturally decay resistant wood is substantially higher in deck surface and deck accessory applications as opposed to deck substructures.

Distribution
Developing an efficient distribution channel for AYC decking products will be critical to the market development strategy. Our market research clearly shows that many deck builders cited the lack of availability as a primary reason why they have not been willing to use AYC or why they have not increased their use of AYC. Consequently, it will be important to match the expected supply of products with the size of the target market. Uncertainty over the short-term supply would argue for a more conservative strategy that constrains the size of the target market during the initial phase of the marketing campaign, allowing it to increase only as an increased supply of AYC products become available. Further, given the distance of Alaska suppliers from the target market, we would recommend that Alaska lumber producers consider establishing a relationship with stocking wholesalers that would allow for substantial volumes of product to be inventoried within a target market to reduce the logistical constraints of providing a reliable supply of products within a short timeframe.

Pricing
The survey results suggest that deck builders using naturally durable wood species have a relatively low price sensitivity which supports our recommendation for implementing a premium pricing strategy. In contrast, deck builders placed the highest importance on lumber attributes such as durability, beauty, consistent material quality and reliability of supply. Emphasizing these lumber attributes will further support the premium pricing strategy. We recommend initially pricing AYC slightly lower than similar WRC and redwood products.

Promotion
The promotional message must support the effort of positioning AYC as a high quality decking material. This means that the promotional message should emphasize the beauty, natural decay resistance, durability and consistent material quality of AYC. This can be effectively done by a direct comparison of AYC, WRC and RW across the major product attributes. As part of this strategy it may be useful to distinguish AYC from WRC and RW in terms of color, contrasting its light color to the darker colors of WRC and RW. This strategy will appeal to deck builders and home owners who are looking for a decking material that has beauty, durability and natural decay resistance but which provides a unique light colored appearance.

The promotional strategy must address the fact that many deck builders (and home owners) are unfamiliar with the properties and appearance of AYC. This can be accomplished through a variety of strategies, including working with stocking wholesalers to build sample decks in their show rooms and establishing a website to educate potential users on the properties, end-uses and benefits of using AYC.

The survey data further indicated that deck builders utilized a broad range of information sources to learn about new decking materials. As a result, we recommend that AYC producers consider a low-cost strategy to provide information on AYC across a broad range of media including the internet (through use of a website on AYC), attendance at trade shows (for example, the annual Deck Expo conference), material spec sheets for distribution through stocking wholesalers, advertising in industry magazines and advertising in consumer lifestyle magazines that emphasize the outdoor living. Finally, it may be useful to consider the possibility of offering promotional incentives for stocking wholesalers who install sample AYC decking exhibits in their sales showroom area and who meet specified sales goals

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REVIEW OF THE LITERATURE ON THE US DECKING MARKET

Introduction

The demand for decking materials in the US is driven by several factors, including the macroeconomic environment, demographics, construction starts, and the repair and remodel sector. In addition, competition within the decking market has been significantly altered by regulatory constraints on the forest products industry and competition from substitute materials. In particular, consumer preference for new decking materials, based on improved product attributes such as improved durability, aesthetics, ease of maintenance and availability of accessory products (e.g., matching railings, benches, stringers and stair treads), has significantly altered the competitive landscape within the decking industry. These last two factors are likely to have the greatest impact on the specification and use of decking materials in the mid to long term as the market adjusts to the changing regulatory environment and changing consumer preferences. This report will explore the influence of these factors on the demand for decking materials in the residential construction industry.

Macroeconomic Overview

Following a decade of strong economic growth during the 1990s, the US economy entered a relatively short lived recession that lasted from March to October of 2001, Figure 1. However, a combination of factors, including the terrorist attacks of

Figure 1. GNP growth rates over the period 1965-2003.

Source: http://www.bea.doc.gov/bea/dn/gdpchg.xls

September 2001, the stock market scandals, and the wars in Afghanistan and Iraq have contributed to weakness in the business sector and resulted in an underperforming economy despite the fact that consumer interest rates are at the lowest levels in current history. Economic growth in the first half of 2002 averaged just 1.5% although growth has improved, exceeding 4% in 2004. In the longer term, the Federal Reserve has indicated that economic growth should be in the range of 3.75-4.75% in 2004 and 2005. The Fed has also indicated that they do not expect inflation or deflation to pose a serious threat to the US economy, an expectation that could allow it to moderate interest rates as the economy improves.

Historically low mortgage rates have increased the percentage of Americans who own their own homes. Perhaps more importantly, low mortgage rates have allowed many Americans to refinance their mortgages and reduce their monthly payments, thus increasing their disposable income. At the same time, homeowners have cashed out some of their equity in their homes to reduce their consumer debt or to finance new spending, Figure 2. This has allowed consumer spending to grow faster than income over the past several years. The net result is that US consumers continue to exhibit low savings rates while increasing their consumer debt, leaving them vulnerable in the event of an extended economic downturn (Economist 2003).

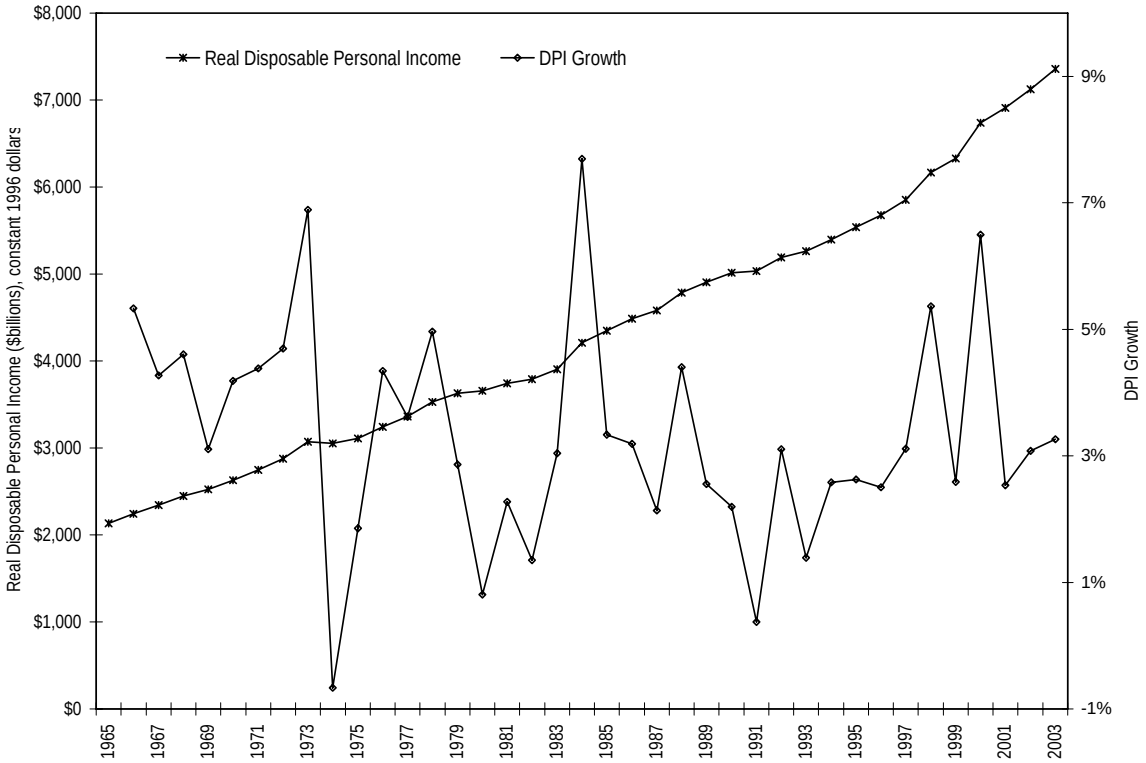

Figure 2. Real disposable income and disposable income growth rates.

Source: US Bureau of Economic Analysis, 2003 (http://www.bea.doc.gov/bea/dn/nipaweb/SelectTable.asp?Selected=N#S7)

However, it is expected that the aging baby boomer cohort will begin to increase their savings rate in an effort to reduce their household consumer debt and accumulate sufficient assets in anticipation of their approaching retirements. As the boomers move towards retirement age, they are expected to reduce their spending on big ticket durable goods although their spending on items that improve their quality of life, including exterior decks, is expected to increase.

Demographic Trends

In addition to macroeconomic factors, demographic trends also influence the demand for decks, with an increasing population contributing to an increase in housing starts and existing home sales which in turn translates into increased investment in new decks. This investment occurs not only within the new residential construction market but also within the existing home market where improvements often occur immediately prior to the sale of an existing home or within a few years of its purchase. This trend is not only supported by increases in the US population but is further reinforced by the fact that the average household size continues to decrease. These two trends, an increasing population and a declining household size, reinforce the demand for housing in the US and have contributed to the strength of the residential construction industry (in conjunction with low mortgage rates) over the past decade, Figure 3.

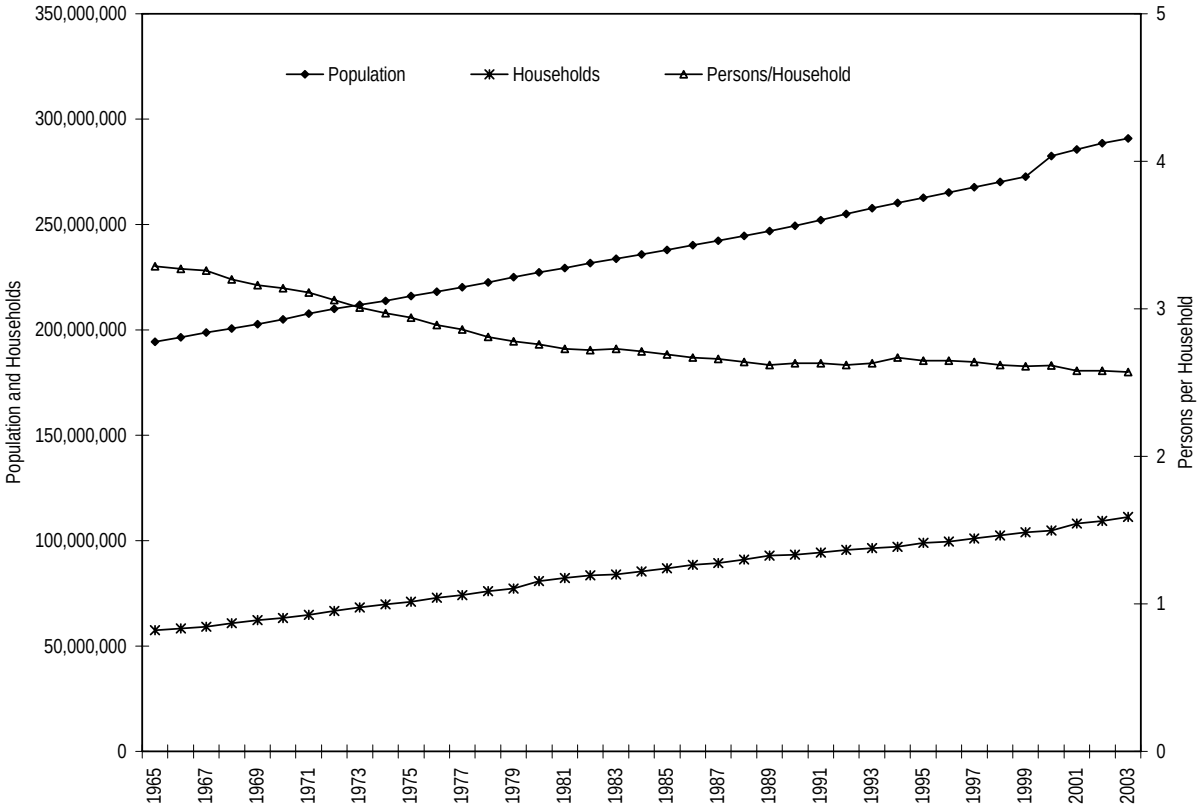

Figure 3. US population, number of households and household size trends.

Source: US Census Bureau, 2003 (http://www.census.gov/population/socdemo/hh-fam/tabHH-6.xls)

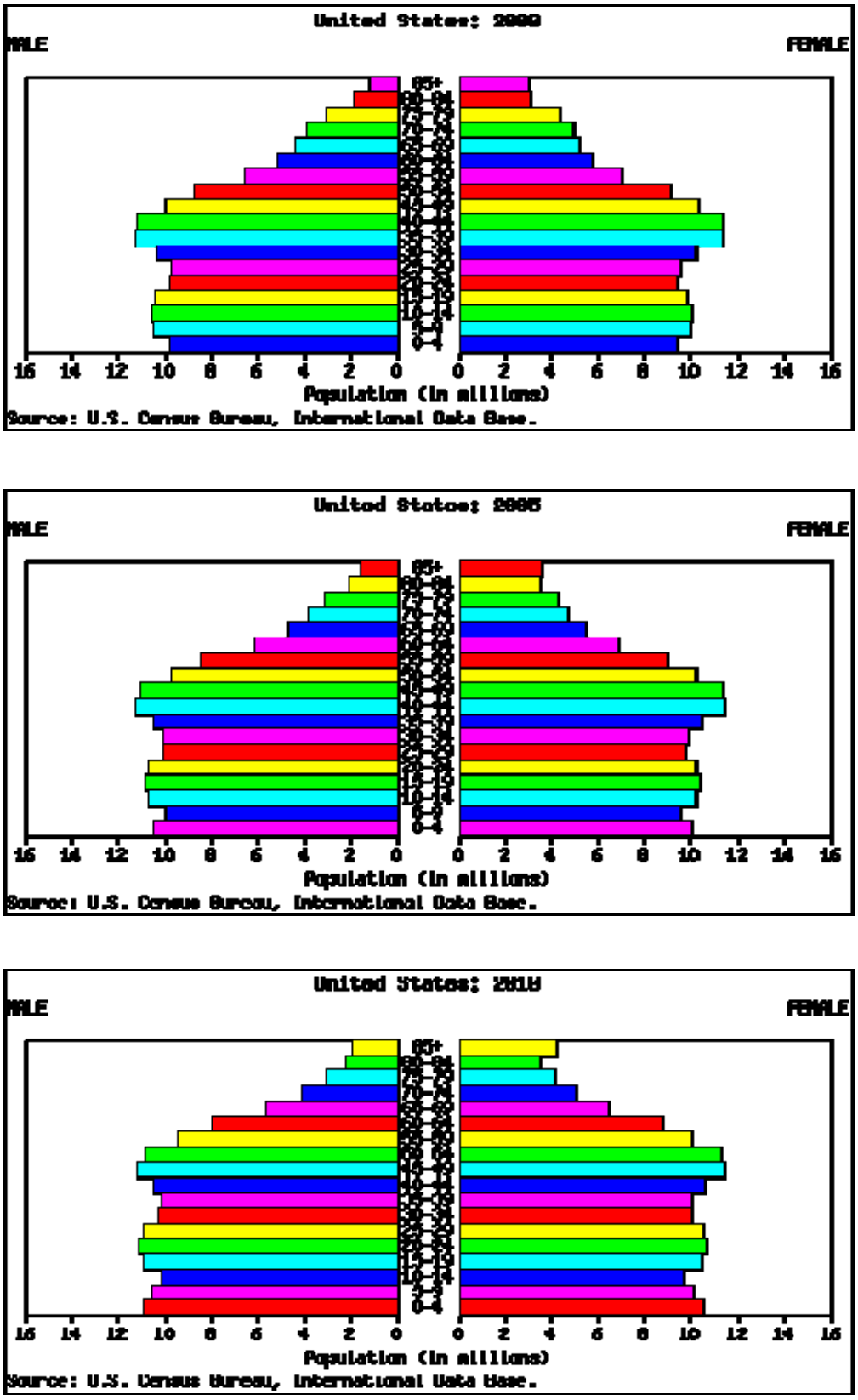

Figure 4. US population pyramids for the years 2000, 2005, and 2010.

Source: US Census Bureau, 2003 (http://www.census.gov/cgi-bin/ipc/idbpyrs.pl?cty=US&out=s&ymax=250)

The distribution of population cohorts is perhaps more important when considering the impact of demographic trends on the demand for decking products. In particular, the age cohorts comprising people from 45-54 years of age and from 55-64 years of age will experience growth rates that are substantially higher than that of most other age cohorts, Figure 4. The population of both of these age cohorts is expected to total 72.8 million by the year 2005. The rapid growth of these age cohorts can be expected to fuel a growing demand for decking materials for several reasons: consumers in these age cohorts generally have substantial amounts of disposable income and consumers in these age cohorts are more likely to invest in exterior improvement projects that improve their quality of life. In addition, consumers in these age cohorts tend to favor higher quality exterior building materials that possess lower maintenance requirements. The combination of these factors tends to indicate that the markets for decking materials can be expected to increase over the 2002-2010 period and beyond.

Construction Industry Expenditures

Construction expenditures are the primary driver of demand for decking materials. Construction of new residential and non-residential buildings, as well as additions to existing structures, directly generates demand for decking materials. In addition, maintenance and replacement of decks also support the demand for decking materials. Finally, expenditures in public facilities such as marina structures, port structures and park structures influence the demand for decking materials.

Real expenditures in the construction sector increased substantially over the period 1996-2002, despite modest declines in 2001 and 2002, Figure 5. This trend was driven by a decade of strong growth in the residential construction sector which has been unaffected by the short recession in 2001 or the slow economic growth in 2002 and the first half of 2003. Residential construction expenditures grew by 71.5% during the period 1991-2002 while public construction expenditures grew by a slower 37.9% over the same period and non-residential construction expenditures were essentially unchanged over this period due to a sharp decline in expenditures in 2002.

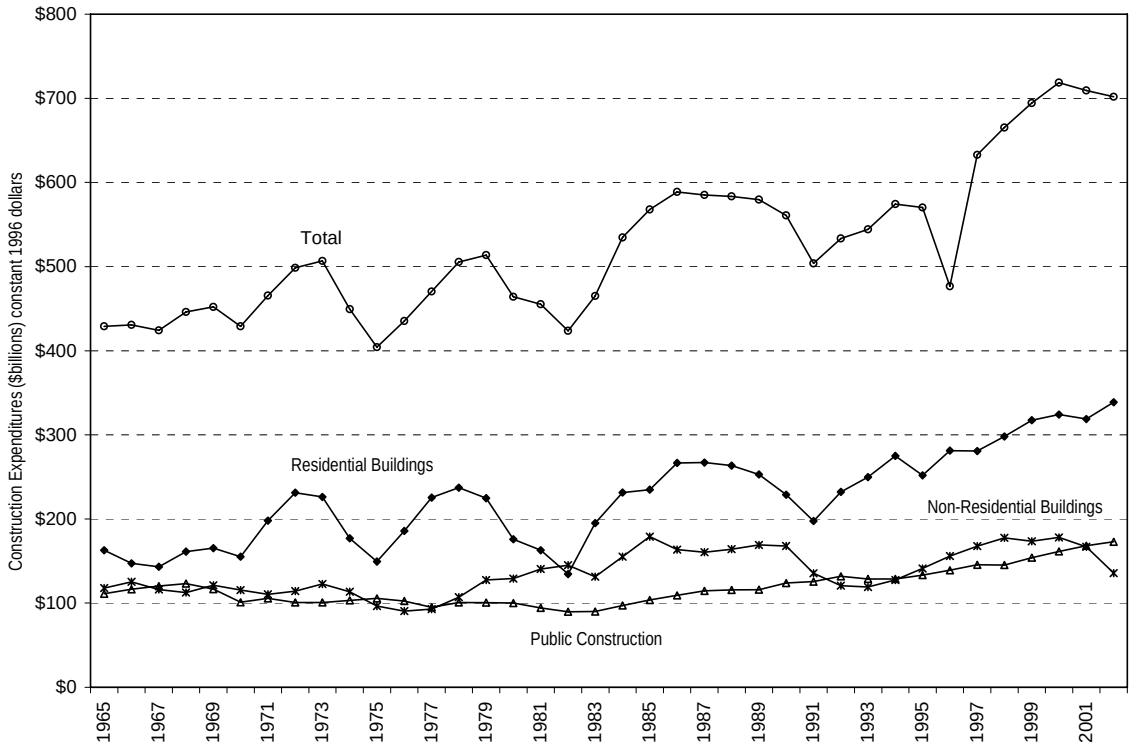

Figure 5. Real construction expenditures, by type, in 1996 dollars.

Source: US Census Bureau, Construction Statistics, 2003 (http://www.census.gov/const/C30/c30_hist.html)

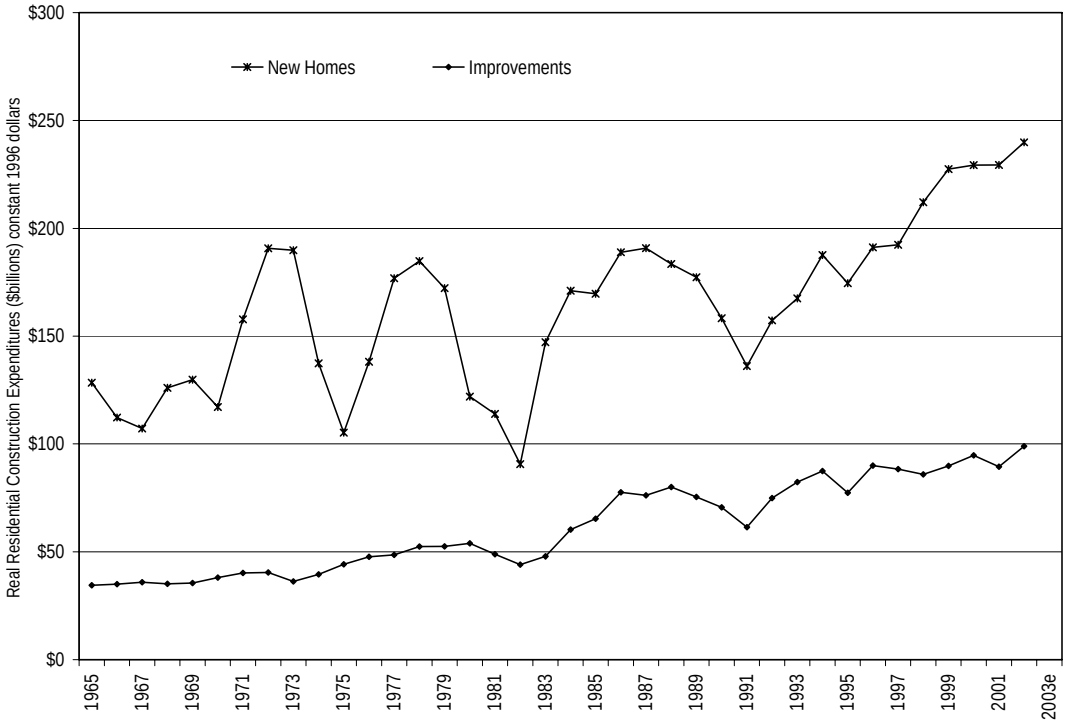

Figure 6. Real construction expenditures on new homes and residential improvements.
Source: US Census Bureau, Construction Statistics, 2003 (http://www.census.gov/const/C30/c30_hist.html)

Increases in residential construction expenditures continued throughout the 1991-2002 period in both new construction and residential improvements, Figure 6. The growth in new construction expenditures exceeded 70% during this period while the growth of expenditures for residential improvements increased by a healthy 61.1%.

Residential Construction Sector

The number of new housing starts is one of the most important indicators of demand for decking materials. A recent market research report estimated that in 2002 over 62% of the total demand for decking materials was generated within the residential construction sector, including both new construction and repair and replacement activities by homeowners (Freedonia 2002).

Housing Stock and Existing Home Sales

It is estimated in the National 2001 American Housing Survey that the housing stock in the year 2001 was 119,100,000 as compared to 86 million units in 1980. The change in housing stock has varied substantially over the various periods of the Housing Survey. For example, the average increase in the housing stock over the period 1980-1983 was 2.5 million units. Annual changes in the housing stock for subsequent periods were 2.3 million units (1984-1987), 0.63 million units (1987-1990), 0.67 million units (1990-1993), 1.45 million units (1993-1997), and 1.68 million units (1997-2001).

While analysts often closely track the number of new homes built in the US as a proxy for the demand for building materials, they tend to pay less attention to the number of existing home sales. However, existing home sales exert a much stronger influence on the demand for decking materials than does the construction of new residential homes. For example, in 2002 it is estimated that 86.3% of the demand for decking materials was attributed to repair and remodel activities by homeowners (Freedonia 2002).

This is due to several factors which work together to influence the demand for building materials. First, the number of existing homes sold annually exceeds the number of new homes built by a factor of approximately 4, Figure 7.

Second, home owners preparing to sell their homes often invest in improvements, including new decks, which can increase the sale price of the house or improve the sales prospect. Finally, buyers of existing homes often invest significant amounts of money in improvements during their first few years in the house. Real estate sales statistics indicate that existing home sales have increased at a much faster rate than has new home construction. During the period 1991-2004, the number of existing home sales increased from 3.2 million to almost 7 million units while new home sales increased from 509,000 to over 1 million homes.

New Home Construction

The residential construction sector has continued to defy the economic trends over the past several years, Figure 8. The continued strong performance of the residential construction sector gives strong support to the idea that residential housing starts are much more sensitive to mortgage rates than they are to other general measures of economic performance. With mortgage rates hovering at historic lows, home builders continue to ignore the anemic performance of the economy and housing starts in 2003 and 2004 exceeded 1.7 million units. In addition, the size of the average house continues to increase, growing from approximately 1,500 square feet in 1980 to over 2,200 square feet in 2004, Figure 9.

New home construction is another, albeit somewhat less important, driver of demand for decking materials for two reasons. First, the number of new housing starts is significantly lower than the number of existing homes sales. Second, the number of new homes that are sold with an attached deck has been declining overall while the number of new homes that are sold with a patio has been increasing. In general, it can be assumed that whereas most decks are built using wooden building materials, the vast majority of patios are built using with concrete or cement. Census statistics indicate that while the number of new homes built with decks has declined from 37% in 1992 to 29% in 2002, the number of new homes built with a patio has actually increased from 37% in 1992 to 44% in 2002. Overall, the percentage of new homes built with either a deck or patio (or both) has remained relatively stable over the past decade at approximately 74%.

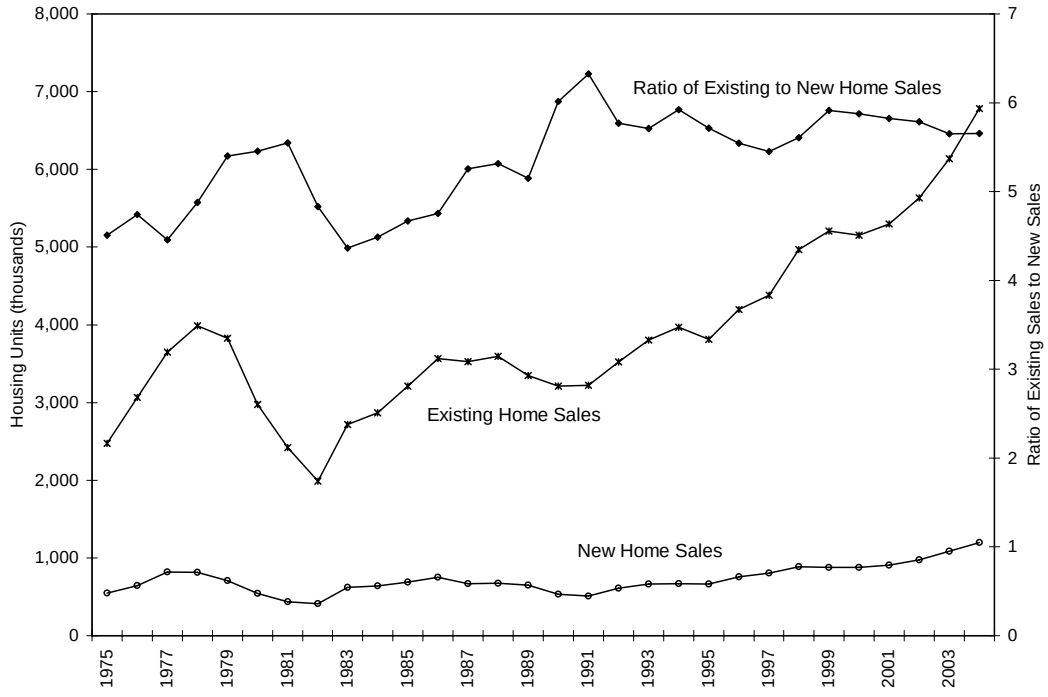

Figure 7. Comparison of new home and existing home sales, 1975-2004.
Source: US Census Bureau, Construction Statistics, 2003. (http://www.census.gov/const/startsan.pdf)

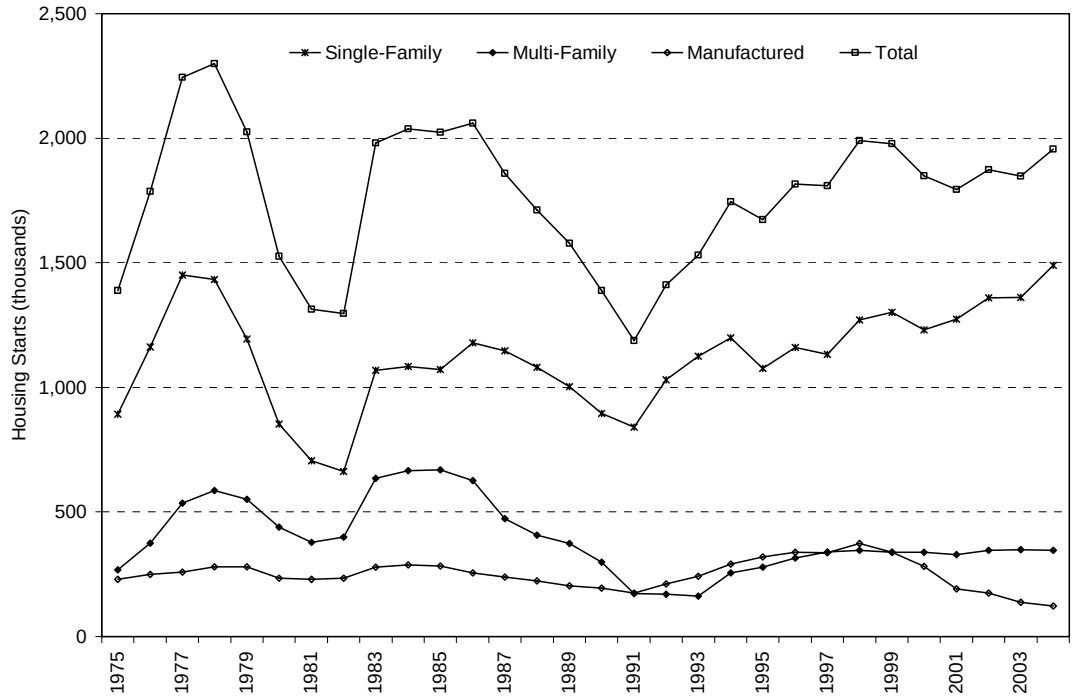

Figure 8. Housing starts by type, 1975-2004.

Source: US Census Bureau, Construction Statistics, 2003 (http://www.census.gov/const/startsan.pdf)

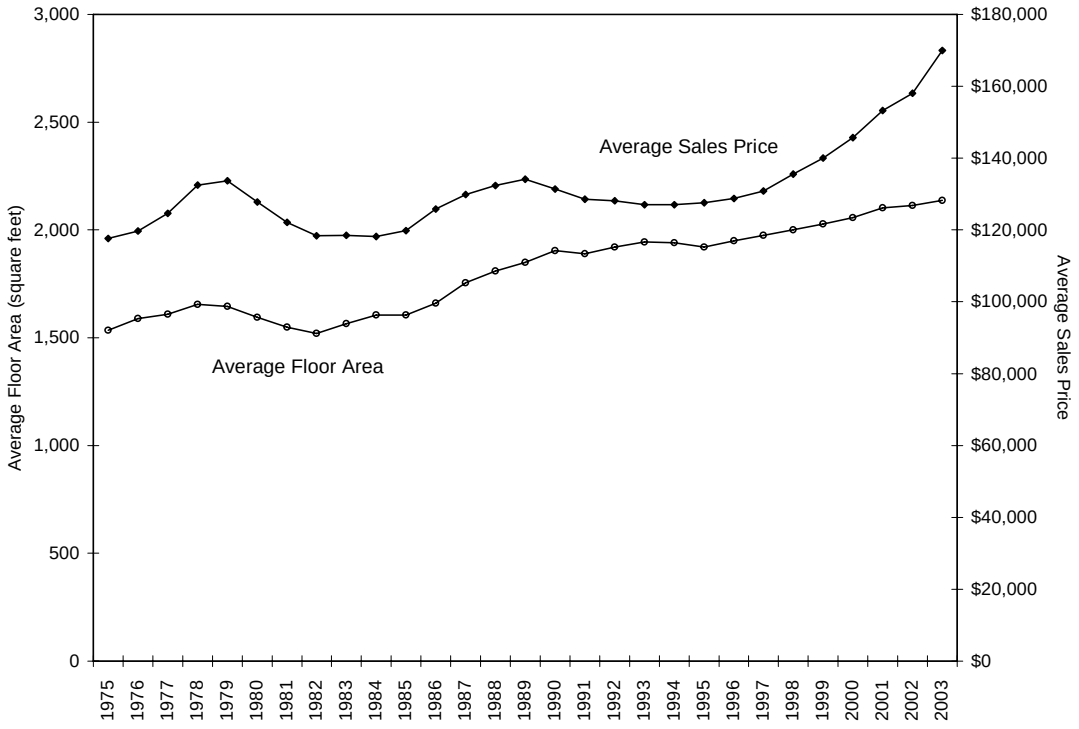

Figure 9. Average floor area and sales price for homes in the US, 1975-2003.

Sources: US Census Bureau; http://www.census.gov/const/startsusintenta.pdf

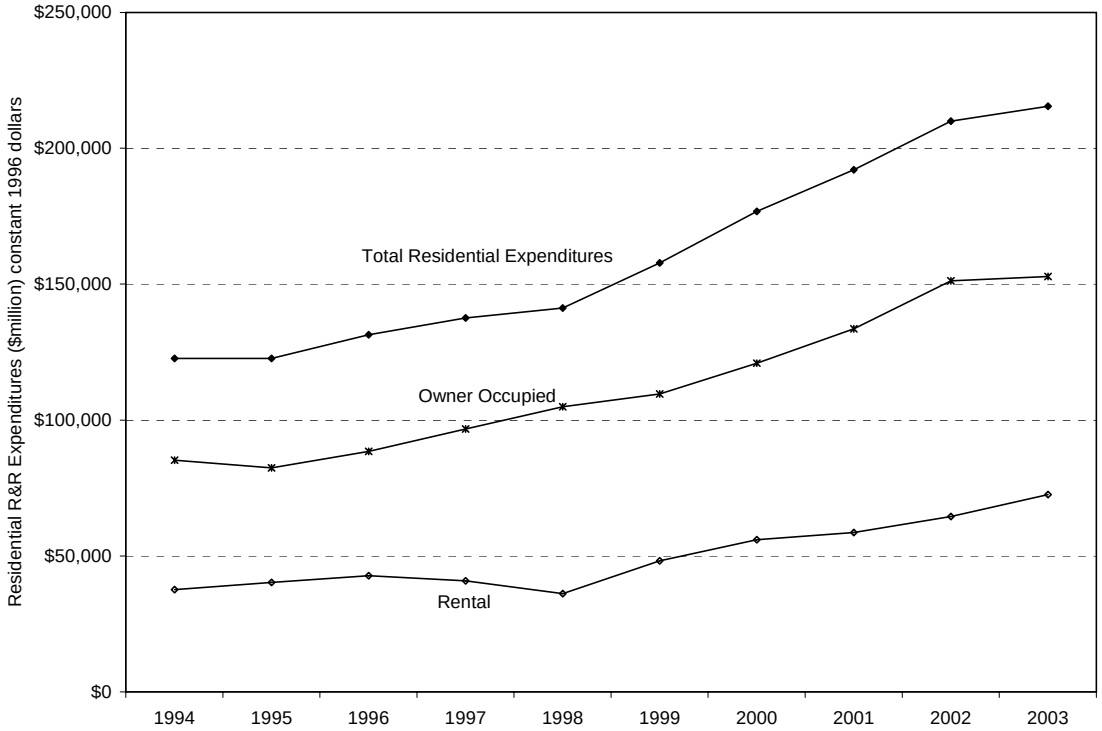

Figure 10. Total repair and replacement expenditures within the residential housing sector.
Source: www.census.gov/const/C50/histtab2.pdf

Repair and Replacement Expenditures

As noted previously, the single most important driver of demand for decking materials is repair and replacement projects by homeowners, Figures 10 and 11. This category includes the following types of construction projects: repair (improvement) of an existing structure, replacement of an existing structure, expansion of an existing structure, and the addition of a new structure to an existing home. Construction census statistics indicate that total improvement expenditures on residential structures increased from $122.8 billion in 1994 to $215 billion in 2003, a 75% increase, Table 1. The largest portion of residential improvement expenditures, approximately 70%, occurs in owner occupied properties as opposed to rental properties.

Expenditures for decks represent a relatively small percentage of total residential improvement expenditures. Total expenditures on these types of projects in 2001 were $6.7 billion, or just 3.5% of total improvement expenditures, although this ratio was up substantially from the 3.1% recorded in 1994. In 2001, improvement expenditures totaled $2.2 billion for decks and $1.8 billion for patios and terraces. Over 70% of these expenditures were attributed to construction activities on owner occupied properties. Total improvement expenditures on these projects increased by almost 76.8% between 1994 and 2001, a clear indication that homeowners have substantially increased their spending on these types of outside improvement projects.

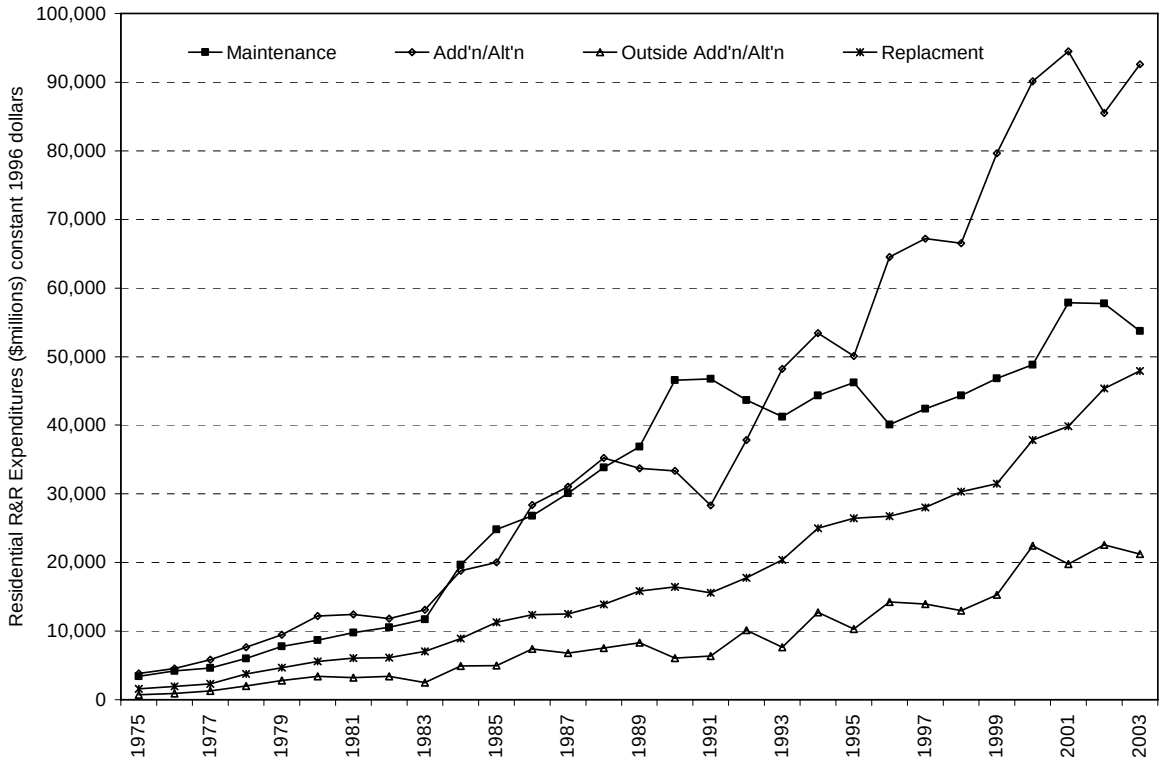

Figure 11. Expenditures for residential improvements and repairs, 1975-2001.
Source: www.census.gov/const/C50/histtab2.pdf

Table 1. Residential repair and renovation expenditures in 1996 dollars ($millions).

	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Total	122,788	122,722	131,355	137,584	141,180	157,905	176,839	192,158
Decks	1,651	2,681	4,729	3,899	2,232	4,525	3,586	2,150
Patios	743	486	1,006	1,398	725	877	1,857	1,821
Fences	1,404	1,557	894	1,930	1,913	3,202	2,810	2,743
% Owner-Occupied	69.4%	67.1%	67.4%	70.3%	74.3%	69.5%	68.4%	69.5%

Source: http://www.census.gov/const/C50/table_s1_o.pdf

US SOFTWOOD LUMBER SUPPLY

Softwood Lumber Production

US softwood lumber production has been historically correlated to housing starts to a surprisingly high degree, Figure 12. However, in the mid to late 1980s two factors came into play that reduced the linkage between housing starts and softwood lumber production. The first of these factors had to do with the rapid expansion of the repair and remodel market in the US. The second factor was supply related and was caused by the timber harvest reductions in the US west that resulted from the federal and state decisions to protect spotted owl habitat in old-growth forests.

The impact of the first factor was to reduce the impact of the economic cycle on softwood lumber demand. Historically, softwood lumber production plunged when housing starts declined during slowdowns in the US economy. However, the emergence of the repair and remodel market, and particularly the large home centers that cater to this market segment, reduced this dependence and helped to buffer the softwood lumber industry from the declines in housing starts, Figure 13. In addition, this new demand helped to move the demand curve for softwood lumber outward faster than the US sawmill industry could expand, leading to increased imports as will be discussed in the following section. As a result, softwood lumber consumption hit records levels throughout the late 1990s, totaling 56.6 billion board feet in 2004. At the same time, softwood lumber production expanded to almost 37 billion board feet while softwood lumber imports reached a record 21 billion board feet.

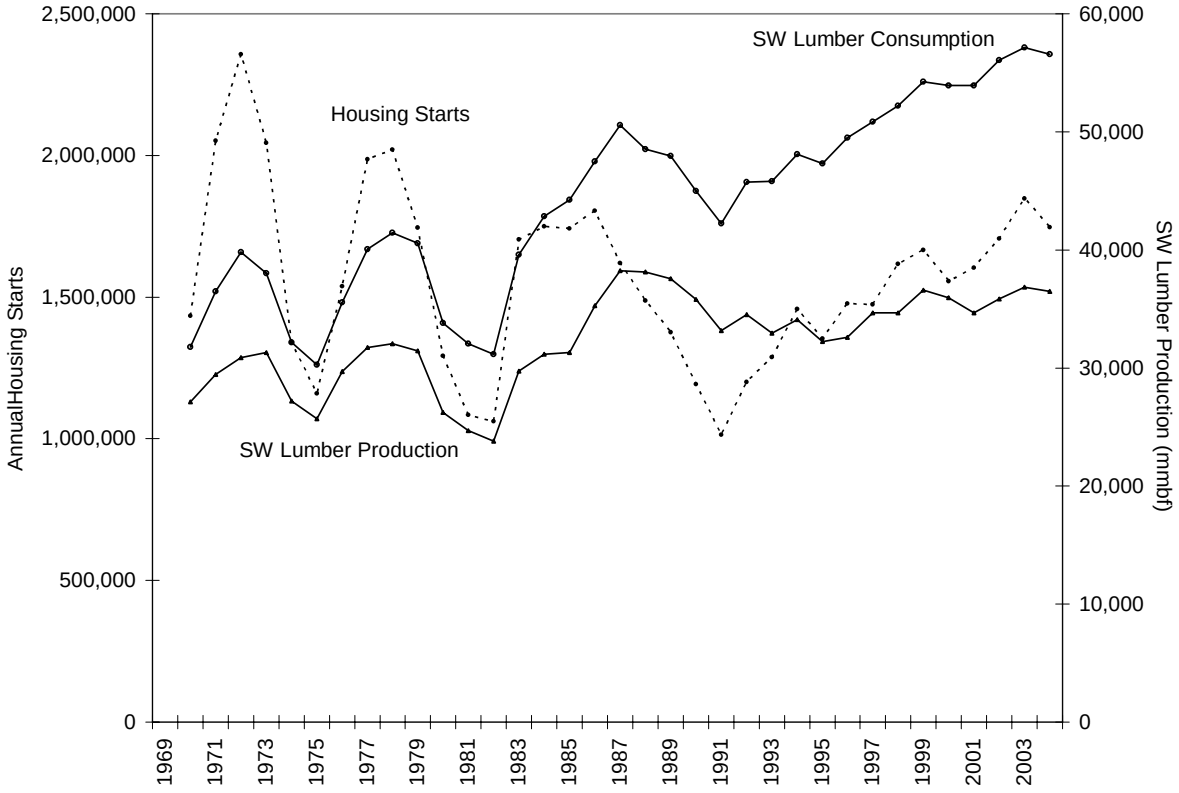

Figure 12. Trends in housing starts, softwood lumber consumption and production, 1970-2004.
Source: WWPA Annual Yearbook, various years

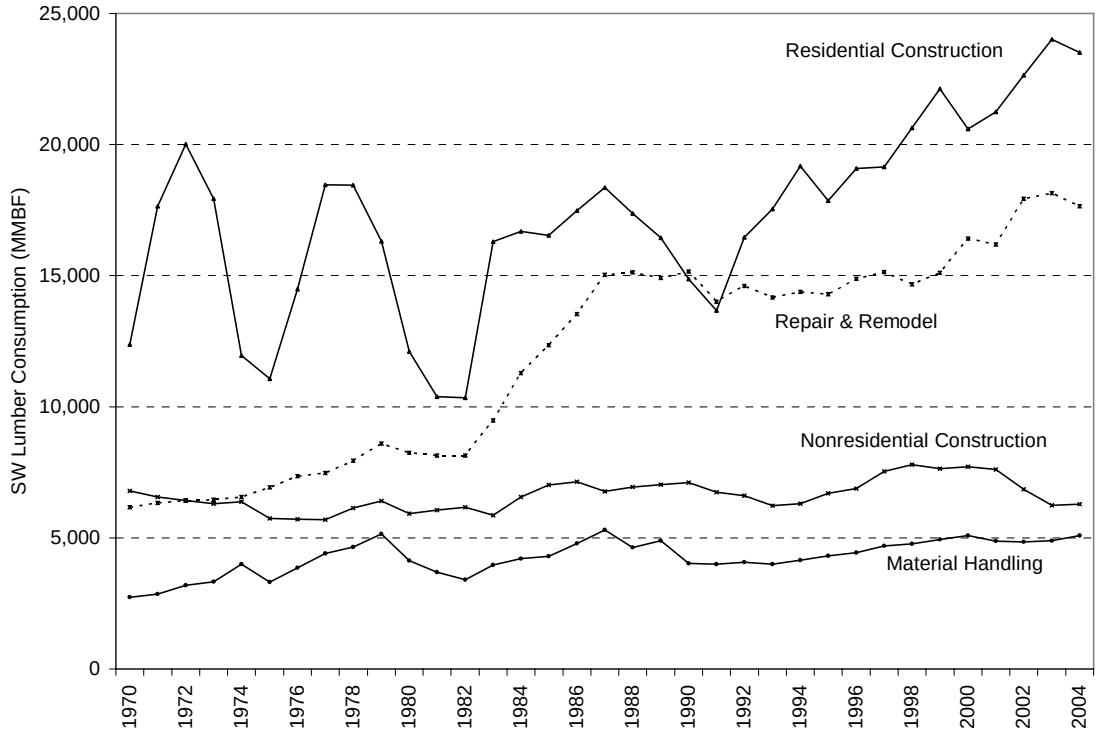

Figure 13. Softwood lumber consumption, by end-use market, 1970-2004

Source: WWPA Annual Yearbook, various years

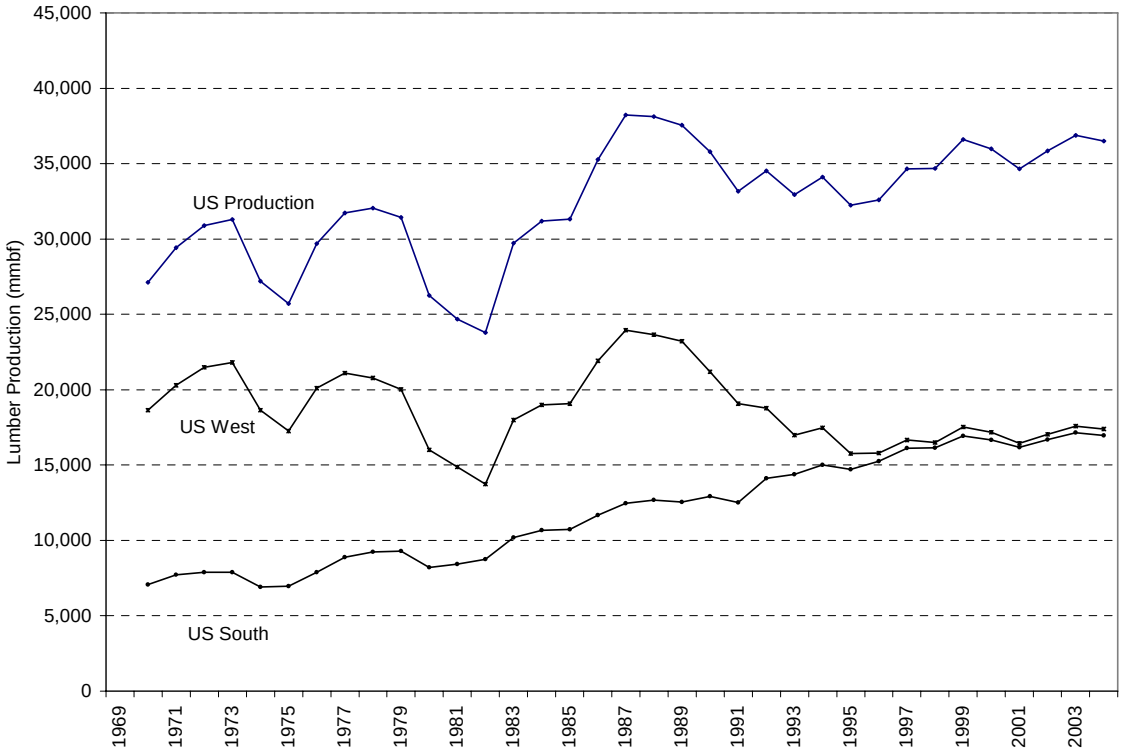

Figure 14. US softwood lumber production, by region, 1970-2004.

Source: WWPA Annual Yearbook, various years

The second factor that impacted the US softwood lumber industry was the decision in early 1990 to list the spotted owl as an endangered species and prohibit virtually all timber sales in federal and state old-growth forests in Washington and Oregon. While this decision had a devastating impact on the western sawmill industry, it provided an opportunity for sawmills in the US south to expand their production to take advantage of the increasing demand for softwood lumber in the US, Figure 14. The net result of this decision was that the western share of US softwood lumber production plummeted from 61.8% in 1989 to just 44% in 1994. However, shutdowns of older, less efficient western mills and investments in newer small diameter sawmilling technology have increased the efficiency of western sawmills and allowed them to increase their lumber production and increase their share of US softwood lumber production to 47.7% by 2004. Despite this, US sawmills have been unable to increase their production capacity at the same rate as consumption has increased, resulting in increasing imports of softwood lumber throughout the 1991-2004 period.

The three largest producers of softwood lumber in the US west are Oregon, California and Washington, Figure 15. While timber harvest restriction in state and federal forests caused softwood lumber production to decline in all three states during the first half of the 1990s, by the mid-90s both Washington and Oregon had begun to expand their production of softwood lumber. In contrast, softwood lumber production in California

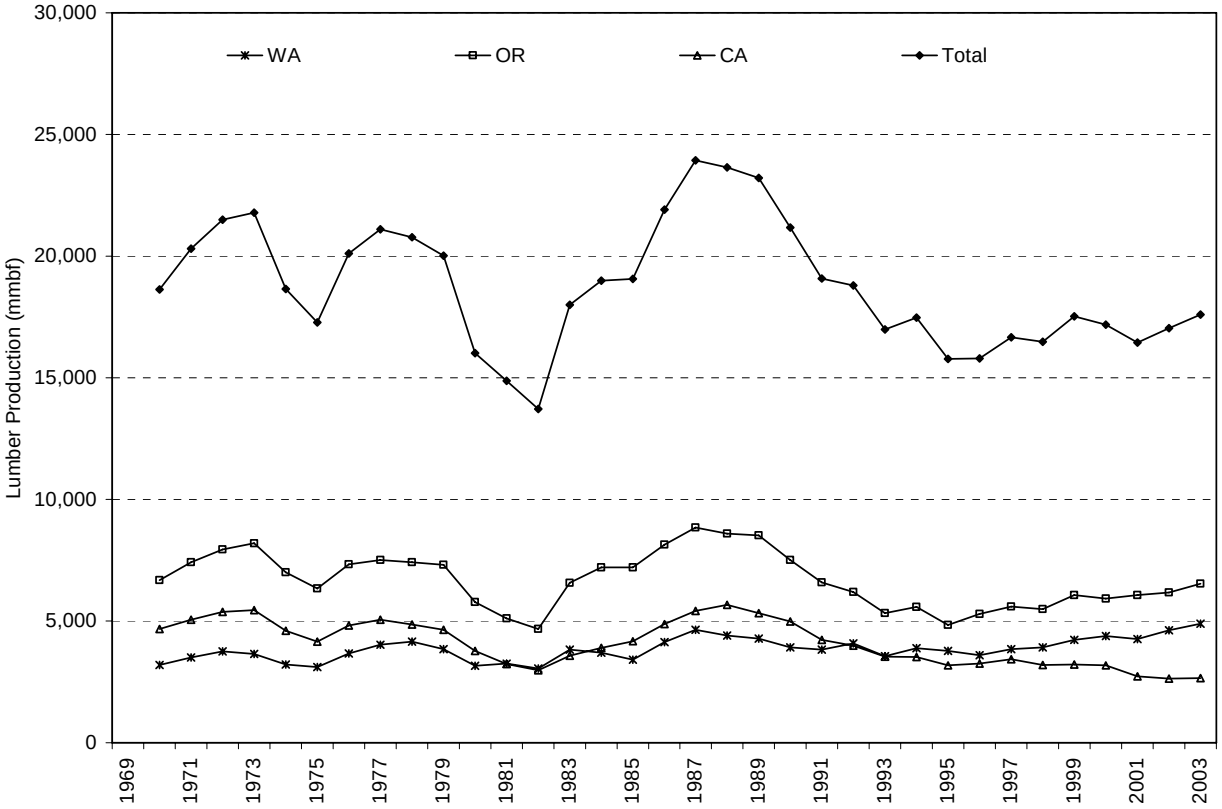

Figure 15. Softwood lumber production in Washington, Oregon and California.
Source: WWPA Annual Yearbook, various years

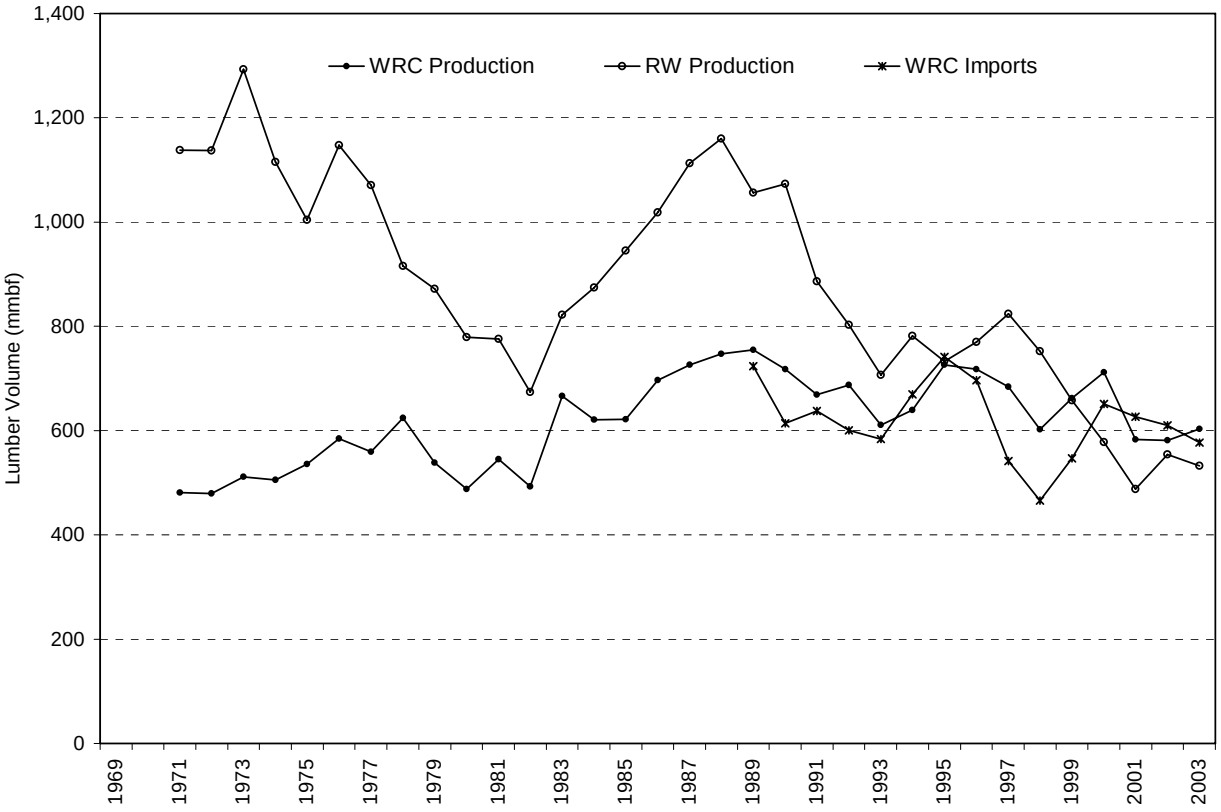

Figure 16. Production and import of redwood and western red cedar lumber, 1970-2003.
Source: WWPA Annual Yearbook, various years

continued to decline into 2002. Overall, softwood lumber production in Oregon, Washington, and California has been increasing since the mid-1990s, although it is still well below the volumes produced in the late 1980s.

The primary species used in the production of decks and fences are redwood, western red cedar and southern yellow pine (preservative treated). Redwood lumber production is limited to the state of California and has been declining since 1988, dropping to just 488 million board feet in 2001. Similarly, western red cedar lumber is primarily produced in the coastal region of Washington, although small volumes are produced in western Oregon and western Washington. The production of western red cedar lumber, while variable, has remained relatively constant in the 600-700 million board foot range since the early 1980s. In contrast, the production of southern yellow pine lumber has continued to increase since the early 1970s, reaching a volume of almost 17 billion board feet in 2004, although only a portion of this production is treated for use in decking and fencing applications.

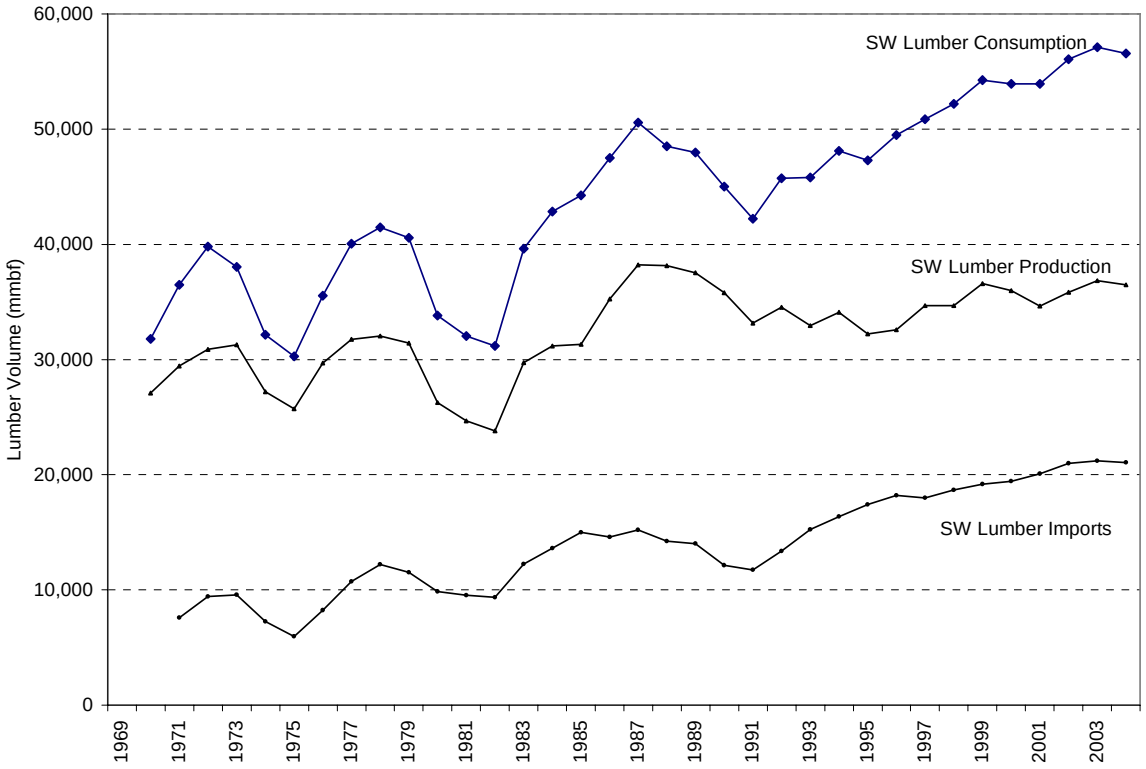

Figure 17. US consumption, production and imports of softwood lumber, 1970-2004.
Source: WWPA Annual Yearbook, various years

US Imports of Softwood Lumber
As noted earlier, while US softwood lumber consumption jumped from 42.2 billion board feet in 1992 to 56.6 billion board feet in 2004 (a 32.6% increase), the ratio of US softwood lumber production to consumption actually declined from 78.5% in 1992 to 64.5% in 2004, Figure 17. The growing gap between consumption and production was filled by increased softwood lumber imports, the vast majority of which originated from Canada, Figure 18. However, while imports of softwood lumber have increased in response to growing demand in the US, they have had the net effect of moderating softwood lumber prices in the US. Many US softwood lumber manufacturers have responded by charging that Canadian lumber producers receive unfair subsidies and are dumping under-valued softwood lumber into the US. This has resulted in a long history of managed trade in softwood lumber between the two countries.

The most recent manifestation of this disagreement occurred in early 2001 when the US-Canadian Softwood Lumber Agreement expired and was eventually replaced with a combined 27.2% anti-dumping and countervailing duty, Figure 19. US softwood lumber manufacturers who had widely expected that the duty would lead to reduced Canadian exports into the US and increased softwood lumber prices were soon disappointed. Canadian manufacturers, faced with a steep increase in their operating costs as a result of the duty, elected to improve their production efficiency and increase their production levels. As a result, Canadian softwood lumber manufacturers were able to reduce their

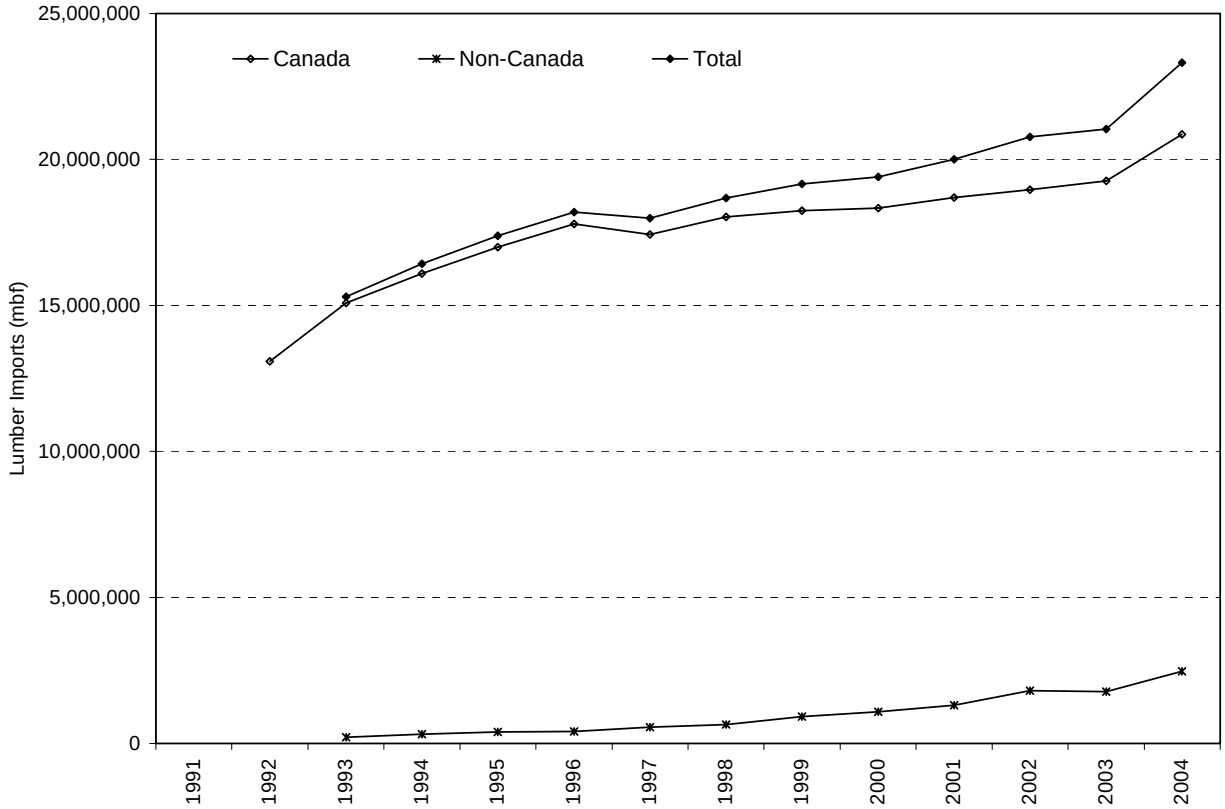

Figure 18. US imports of softwood lumber from Canada and other suppliers.
Source: WWPA Annual Yearbook, various years

unit production costs which allowed them to remain competitive in the US even with the relatively high anti-dumping and countervailing duties. The net result was that Canadian exports of softwood lumber into the US actually increased following the expiration of the US-Canada Softwood Lumber Agreement in 2001. In addition, other offshore suppliers of softwood lumber focused their attention on the US market and imports from these non-Canadian suppliers increased dramatically between 1996 (when the SLA was reached) and 2004, Figure 20. As a result, the Canadian share of US softwood lumber imports actually dropped during this period despite the fact that export volumes from Canada continued increasing, Figure 21.

The impact of these trade restrictions on softwood lumber prices has been disastrous. Clearly the impact of the trade restrictions on Canadian softwood lumber have led to increased prices in the US relative to Canada. This is clearly shown in Figure 19 where the price of the same softwood lumber product is approximately 17% higher in Toronto than Boston. However, this price increase has been more than offset by the increase in exports from Canada, and to a lesser extent, other suppliers. As a result, softwood lumber prices reached historic lows in early 2003, although they have recovered strongly since then. It is important to note that the anti-dumping and countervailing duty also applies to western red cedar lumber imports from Canada.

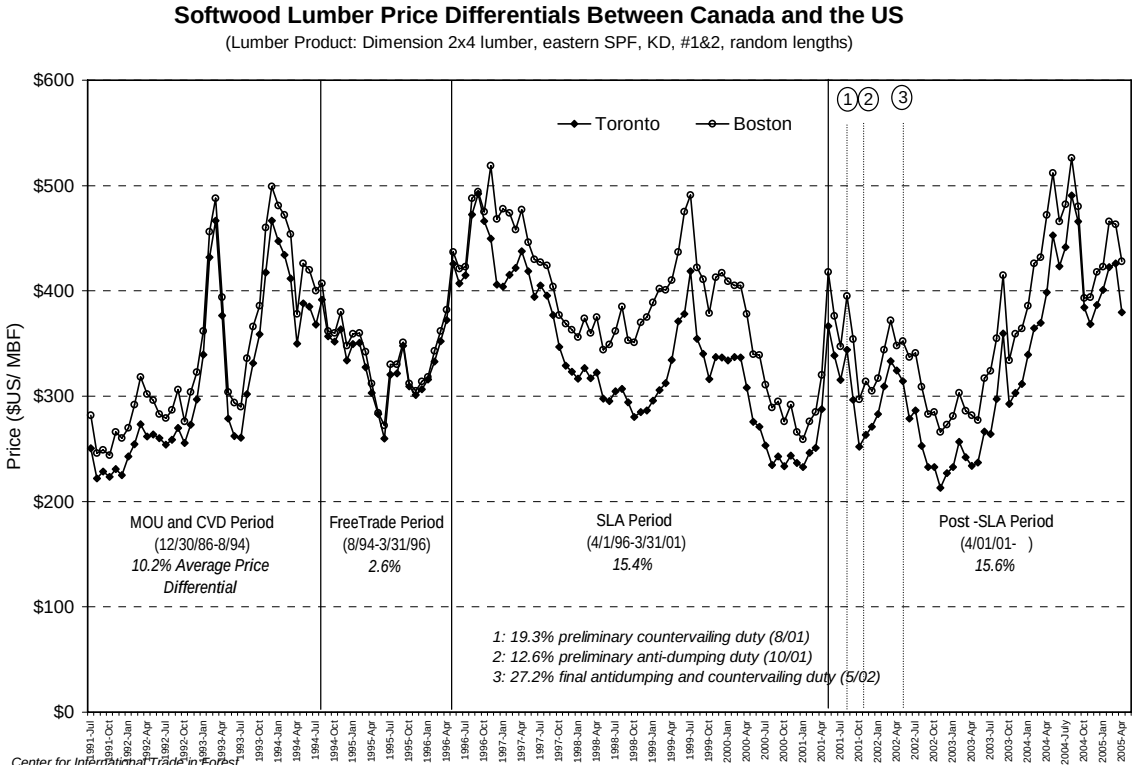

Figure 19. Price differentials for softwood lumber in Toronto and Boston.
Source: Random Lengths, various editions.

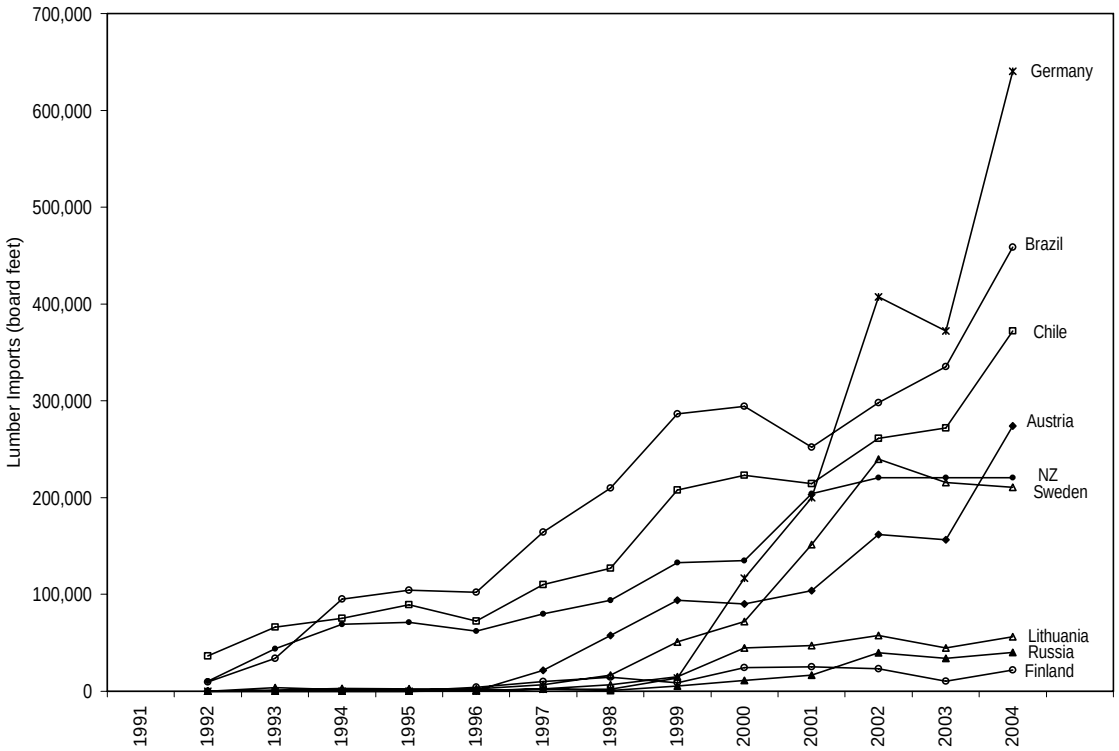

Figure 20. US imports of softwood lumber from non-Canadian sources.
Source: US International Trade Commission Databank (http://dataweb.usitc.gov/scripts/user_set.asp)

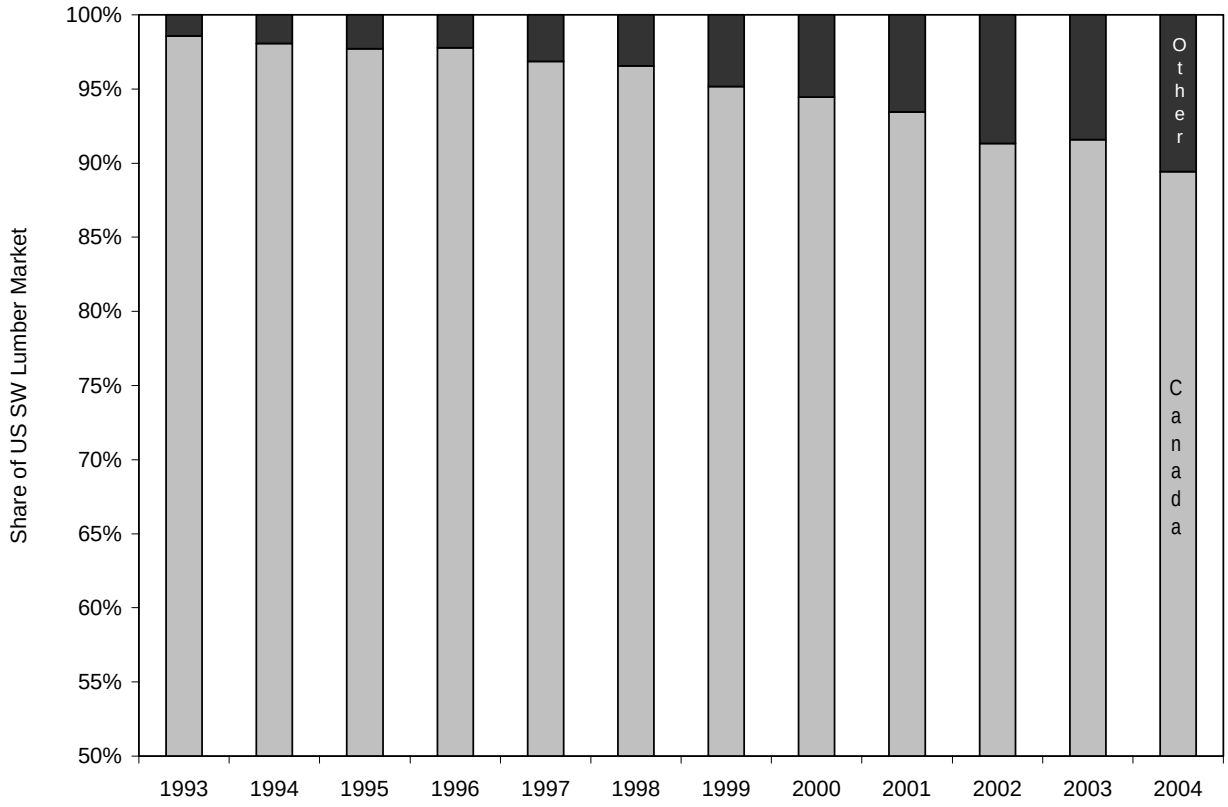

Figure 21. Supplier shares of the US market for imported softwood lumber.
Source: US International Trade Commission Databank (http://dataweb.usitc.gov/scripts/user_set.asp)

US Imports of Decking Wood Products

US trade statistics clearly show that over 90% of the deck products exported to the US originate from Canada. The major products in these categories are western red cedar lumber, redwood lumber and Alaska yellow cedar lumber. The international codes for these products under the international Harmonized Trade System are: western red cedar lumber (4407.10.0068 and 4407.10.0069), redwood lumber (4407.10.0082 and 4407.10.0083) and Alaska yellow cedar (4407.10.0062 and 4407.10.0063).

Canadian exports of western red cedar lumber declined dramatically during the period 1995-1998 although they recovered strongly between 1998 and 2000. They declined slightly in 2003 before recovering in 2004, recording a volume of just over 1.4 million m^3 (or 600 million board feet). The volume of WRC lumber imported annually over the period 1989-2002 has been roughly equivalent to the volume of WRC lumber produced domestically in the US, Figures 16 and 22. Imports of redwood lumber and AYC lumber are relatively minor, totaling just 2,588 m^3 and 15,330 m^3, Figure 23. It is interesting to note that the majority of redwood lumber imports come from Mexico and New Zealand. Another source of competition in the decking market derives from imported tropical hardwood lumber. Unfortunately, the US import statistics do not individually identify most of these species and it is impossible to determine the volume of decking species such as ipe or jarrah that are imported into the US.

Figure 22. US imports of western red cedar lumber.
Source: US International Trade Commission Databank (http://dataweb.usitc.gov/scripts/user_set.asp)

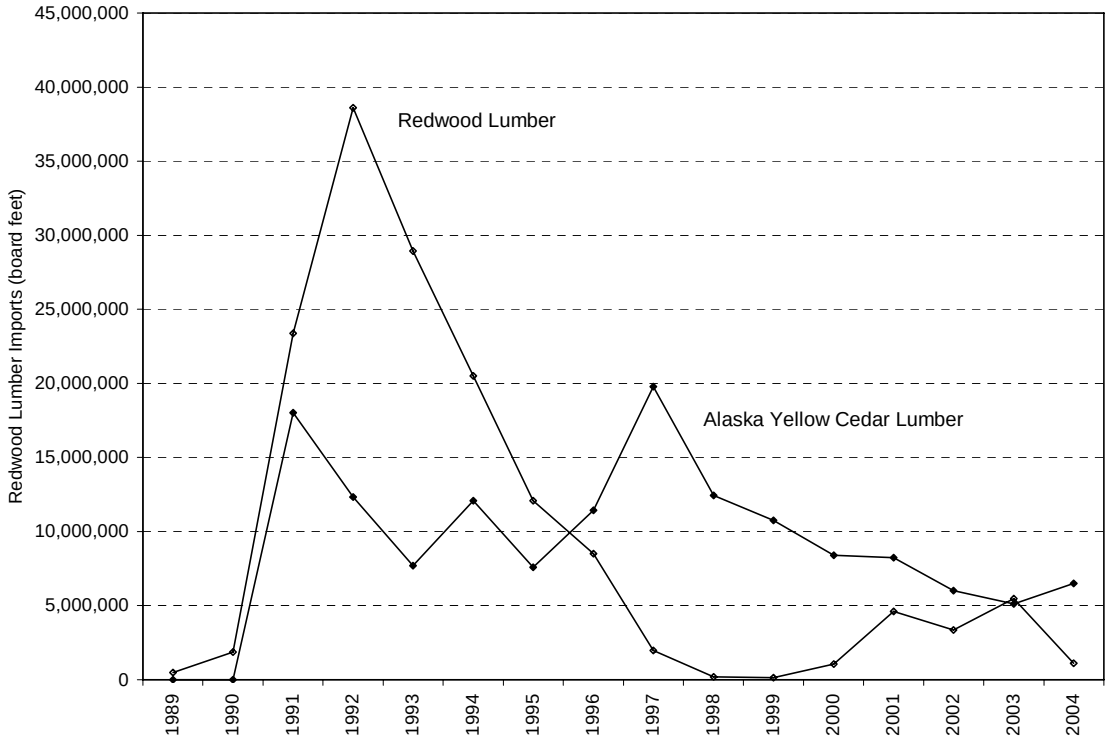

Figure 23. US imports of Alaska yellow cedar and redwood lumber (board feet).
Source: US International Trade Commission Databank (http://dataweb.usitc.gov/scripts/user_set.asp)

US DECKING MARKET

Decking Market Characteristics

Few research studies have been published concerning the residential decking market despite its considerable size. After a thorough search through a large number of databases, less than two dozen articles and reports were found to address, either specifically or tangentially, the residential decking market. Therefore, due to the modest amount of information currently available, this section on residential decking products will draw together all the information that is contained within these sources.

General Market Information

The demand for residential decking materials is a function of several factors. First, the number of new residential home starts influences the demand for decking materials. For instance, US Department of Commerce data shows that over 85% of new single family homes include a deck, patio, porch, or balcony. Second, demand for decking materials is influenced by the amount of activity occurring in the residential remodeling, renovation, and home improvement markets. Survey results from one study, for instance, indicate that 4.2% of all households in the US added a deck to their existing home in 1991 (Home Improvement Research Institute 1993). Similarly, consulting research conducted by George Carter & Affiliates (1989b) found that 4.1% of all households in the US added a deck in 1987, which resulted in 3.6 million new decks. Furthermore, the importance of the do-it-yourself (DIY) market is evident in the fact that nearly 46% of all households have built a deck onto their home as a DIY project during their tenure as a homeowner (Home Improvement Research Institute 1993). Finally, demand for decking material is influenced by the rate of replacement of decks already in place.

Results summarized in George Carter & Affiliate's (1989b) consulting report provide some detail on the general characteristics of the residential decking market in the US during 1987. These include:

- The average cost of a deck was $1,086, with the cost being highest in the Northeast ($1,254) and lowest in the South Central region ($847).
- The major cost element in deck construction was for materials, which accounted for 68% of monies spent.
- The average deck consisted of 86.3 board feet of posts, 251 board feet of joists, and 506 board feet of lumber.
- Decks in the South Atlantic US tended to be nearly twice as large as decks in the US West and South Central regions.

Research results reported by Shook and Eastin (2001) indicate that approximately 6.5 million decks are constructed in the US on an annual basis at an installed cost of $1.9 to $3 billion. R.E. Taylor & Associates (2002) estimate the current retail value of the residential decking market at about $2.5 billion in 2002, while another source places the retail value at $4 billion (Anonymous 2003). Shook and Eastin also report that the market size for the deck market expanded at an annual rate of more than 8% during the decade of the 1990s. Growth of the market is expected to continue at an annual rate of 7.5% over the next four to five years (Anonymous 2003). General characteristics of decks in 1999, as reported by Shook and Eastin include the following:

- Nearly 60% of new spec homes and 68% of new custom homes are constructed with a deck.
- The average size of a deck on new spec and new custom homes average 252 square feet and 407 square feet, respectively.
- The total cost of a constructed deck on new spec and new custom homes average $2,997 and $4,923, respectively.

Figure 24 reports the growth of deck material demand based on board foot consumption from 1990 to 2000 as estimated by the Freedonia Group (2002). Clearly, the growth of the deck market has been steady over the past decade, with the exception of one major downturn in the market occurring in 1991 when the residential construction industry suffered a slump. The Freedonia Group also estimates that the volume of demand for deck materials will increase by 1.6% annually to 5.1 billion board feet in 2005. Note that most of the growth in volume demand is expected to be in the wood plastic composite deck materials rather than wood; the volume demand for wood plastic composites is forecast to increase by more than 15% annually through 2005.

The Freedonia Group estimates that about 63.3% of deck materials, by volume, are consumed in the residential market and that this market has the strongest prospects for growth due to increased activity in deck repair and replacement. The nonresidential market consumes approximately 9.2% of deck materials by volume, while 27.5% of deck materials are consumed in non-building construction (e.g., boardwalks, piers/docks, walkways, outdoor furniture).

Approximately 80% of all deck sales in 2000 were installed by a professional contractor (Freedonia Group 2002), with the deck contractor choosing the deck material to install. The Freedonia Group study forecasts that deck material installation and material choice will shift away from professional contractors as a result of strong growth in the DIY market.

The residential decking industry can be characterized by the following: extremely aggressive price competition; modest product differentiation; economies of scale; and well-developed marketing and distribution systems (D.G. Bell & Associates 1986; Smith and Sinclair 1990). The characteristics of manufacturers of residential decking materials are varied. Most firms are small to medium sized. However, several large firms supply a significant proportion of residential decking materials in markets located in certain regions of the US, especially rural regions.

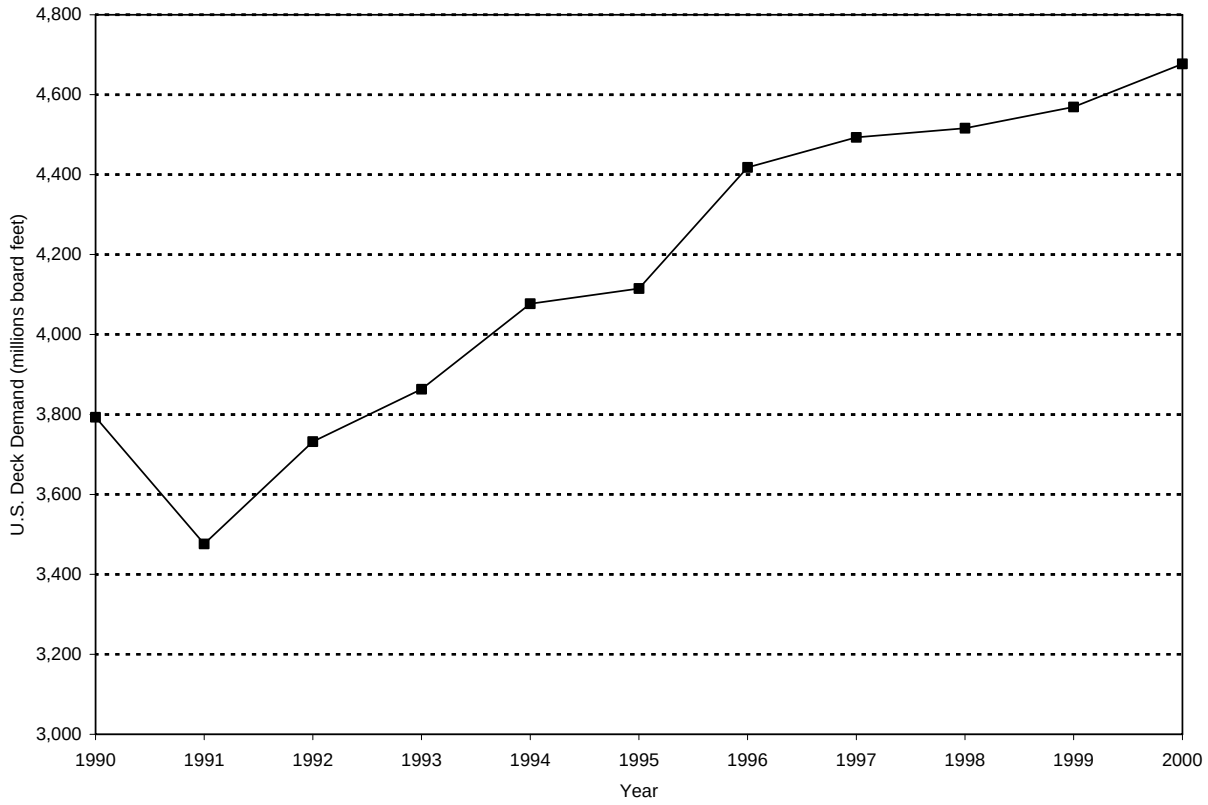

Figure 24. US deck material demand on a board foot basis, 1990-2000.
Source: The Freedonia Group, 2002.

Major Decking Products

Several dozen materials are currently utilized in residential deck construction. It should be noted that many of these materials are only used in relatively small, regional markets. For example, cypress (*Taxodium distichum*) deck boards are utilized to some extent in the US South. Black locust (*Robinia pseudoacacia*) deck posts have been used in markets in the Upper Midwest. Five materials, however, are used to a much greater extent in deck construction

than any others. These materials include naturally decay-resistant solid wood (western red cedar and redwood), treated wood (e.g., southern yellow pine, Douglas-fir, spruce), wood-polymer composite and plastics.

The competitive relationships between the materials used in the residential decking market are established on several factors. The relative difference in material, installation, and maintenance costs between the differing products is the primary basis for market differentiation and product positioning. In addition, product quality factors, such as longevity, durability, and maintenance requirements, are also a basis for product differentiation. Product aesthetics and availability of the material have become increasingly important factors for producers of residential decking materials on which to base competition. This has been especially true in the remodeling and renovation market, where homeowners complete the deck project themselves.

In this section, we examine the characteristics of each the major materials that compete in the residential decking market based on information that is currently available. Specifically, production and distribution, demand, and promotional characteristics are examined. These characteristics are then followed by product characteristics that are considered to differentiate each of the products from their competitors. Finally, a general outlook for each product-market is made.

Redwood

Redwood (*Sequoia sempervirens*) is a tree species that grows in Central and Northern California and in some southern regions of Oregon. Producers of redwood decking materials are essentially small to medium size firms, with the vast majority of production resulting from firms located in California. Redwood decking is distributed nationally.

According to a representative from Crow's, the demand for redwood lumber has remained fairly stable over the past decade, as has price. Also, the price of redwood decking materials is not as sensitive to changes in housing starts and timber constraints relative to western red cedar and southern yellow pine. Industry-wide, redwood decking is promoted by the California Redwood Association. This association heavily promotes redwood decking materials. The promotional and technical information regarding installation and care for redwood decks ranks as some of the the best in the industry. No statistical records on redwood decking production or sales are archived by this association.

Redwood and western red cedar are nearly direct substitutes for one another in the residential decking market, which explains why redwood decking materials are promoted in a nearly identical fashion as western red cedar decking materials. Redwood decking materials, however, are not as available in the national market as western red cedar. Despite this lack of availability, it was found that 12% of all decks constructed in 1987 utilized redwood (George Carter & Affiliates 1989b). Similarly, Shook and Eastin (2001) estimated that the market share for redwood decking materials was 11.1% in 1999. It should be noted, however, that representatives from both Random Lengths and Crows believe that western red cedar holds a competitive edge over redwood as a decking material, especially in southern and eastern US markets, simply due to its greater availability in these markets.

Western Red Cedar

Western red cedar (*Thuja plicata*) is a tree species that grows predominantly in the Pacific Northwest; most notably in Washington State and British Columbia. Due to resource location, a majority of western red cedar decking is produced in these two regions. The producers of western red cedar decking materials range from small firms to large forest products corporations. Western red cedar residential decking materials are distributed nationally. The immediate availability of these materials, however, has been raised as a concern in certain US markets. A D.G. Bell & Associates (1986) report, for instance, suggests that "*cedar producers helped create the treated wood market in this country* [Canada] *because of their pricing policies and the quality and the availability of the product* [cedar] *in the eastern part of the country*."

The demand for western red cedar decking material grew slowly during the 1990s. Lagging demand can be attributed to poor product promotion by producers and increased competition from producers of substitute decking materials, especially from treated wood producers. A survey conducted by George Carter & Affiliates (1989b) found that decks constructed of western red cedar utilized significantly less material than decks constructed of either redwood or treated wood. Specifically, western red cedar decks were found to be constructed with a total of 774 board feet of material, whereas treated wood and redwood decks used 1,029 and 991 board feet of material,

respectively. The survey also found that only 4% of all decks in 1987 were constructed of western red cedar material. Shook and Eastin (2001), however, estimated that the national market share for western red cedar in the deck market in 1999 was 18.5%. The Freedonia Group (2002) suggests that increases in western red cedar deck material demand will "*stem from the replacement of redwood by cedar in some decking applications, as cedar is perceived as more environmentally friendly than redwood and subject to fewer harvesting restrictions.*"

Promotion for western red cedar decking on an industry wide basis is handled by the Western Red Cedar Lumber Association. Their promotional materials for decking products are of high quality. The same can be said for the technical information that they publish and distribute. Promotional materials tend to emphasize the beauty and quality (i.e., image) of western red cedar decking relative to other available decking materials, as well as the fact that it is a naturally durable wood.

Appearance and natural durability are the primary characteristics that differentiate western red cedar decking from other decking materials. Western red cedar decking is also competitively priced relative to alternative decking materials. Promotional materials for other decking materials tend to emphasize that despite western red cedar's natural durability, it does not necessarily have a longer lifespan when used as a decking material. Competitors also point out that the maintenance cost of western red cedar decks tend to be higher over the lifespan of the deck.

Treated Wood

Wood is often given a preservative treatment in order to increase its durability. Increasing durability results in an extended lifespan which reduces the need for replacement. Preservative treatment of lumber also reduces the need for oversize design of structural members to compensate for anticipated deterioration. A wide variety of wood species are treated with chemical preservatives in order to increase their durability and lifespan. The most commonly treated softwood species include: Douglas-fir; hemlock; jack pine; lodgepole pine; ponderosa pine; the southern yellow pines (SYP); spruce; true firs; western red cedar; and western white pine. The vast majority of wood is treated using chromated copper aresenate (CCA). However, CCA treatment is being voluntarily phased out for alternative chemical treatments.

Treated wood is produced by a number of large and small treating facilities generally located in the US South, US West, and Canada. Treated wood can be purchased from every type of lumber distributor and retailer in virtually every market within the US Relative to all other decking materials on the market, treated wood is the most readily available material that can be purchased by the consumer.

Demand for treated wood is primarily driven by two markets; namely, the decking and fence markets (D.G. Bell & Associates 1986). In the late 1980s, eight of every ten residential decks built were constructed with treated wood (George Carter & Affiliates 1989b). The literature indicates two widely varying market share estimates for treated wood. Research by Shook and Eastin (2001) indicated that the national market share of treated wood for use in new residential deck construction had declined to about 47% (Shook and Eastin 2001). They also note that significant regional differences exist in the market share of treated wood. For instance, nearly 73% of decks constructed in the southeast US were constructed with treated wood, while less than 30% of the decks in the northwest and southwest were constructed with treated wood.

For the most part, treated wood is promoted by the American Wood Preservers Institute, the Canadian Institute of Treated Lumber, the Western Wood Preservers Institute, and the Southern Pressure Treaters Association. These four groups aggressively promote treated wood to architects and designers, builders, contractors, and do-it-yourself homeowners. They base a significant amount of their promotion effort on differentiating their product vis-à-vis alterative substitutes. For example, treated wood is heavily promoted at the retail level on its in-service lifespan.

As alluded above, treated wood producers have succeeded in developing a market strategy in which their product is differentiated from other materials available in the residential decking market. Osmose®, Wolmanized®, and to some extent Chemonite® (the registered trade name for ACZA - ammoniacal copper zinc arsenate) wood are highly recognized treated wood brands and are promoted directly against western red cedar and redwood decking materials. Consumers of treated wood are usually granted a 25 to 30 year express limited warranty from the date of purchase and are also provided detailed product safety information. Additionally, a Southern Pressure Treaters Association representative suggests that the industry has succeeded to some extent in getting distributors and retailers to promote treated wood materials more heavily than substitute materials.

Treated wood decking materials also possess some negative characteristics. The perceived health risks associated with using treated wood is one area that industry promotional efforts have attempted to dispel. One method in reducing risk has been the creation of major brand image and brand loyalty, which are two factors cited by Sinclair and Smith (1990) as being vital in relieving consumers' perceived risk of product use. Disposal of treated wood is another major concern to the industry, especially since there has been an increase in the number of municipalities that have banned treated wood from their landfills. For example, the 1994 National Association of Home Builders Annual Industry Survey found that 8% of all builders are banned from using normal waste disposal methods for treated lumber. Burning treated wood waste is illegal in nearly all US municipalities since the resulting fumes are toxic.

Consistent product quality can also be a problem when utilizing treated wood. In fact, Dost (1982) states that there is "*...substantial evidence that salt treated wood at retail frequently does not meet the requirements of the AWPA* [American Wood-Preservers' Association] *Standards, especially with respect to penetration* [of the treatment]." Similar comments are made about West Coast species of wood in an article by Dost in 1988. He suggests that several factors have contributed to poor consistency of treated wood. These include: differences in permeability between species and races of species; differences in preservative formulations; inadequate drying prior to treatment; excessive decay in the wood to be treated; shortened treatment cycles; and a lack of concern by treaters, distributors, specifiers, and code inspectors.

Although treated wood decking materials have several negative perceptions and characteristics, consumer use of the material does not appear to be affected. As stated in a government report prepared by D.G. Bell & Associates (1986), "*The consumer attitude toward treated lumber has been positive due to merchandising and promotional efforts placed behind the major brands, and although there has been some negative publicity regarding the potential health hazards of the product, no negative sales impact has been apparent*."

Treated wood decking materials are likely to be the primary threat to producers of naturally durable wood deck materials. A study by Smith and Sinclair (1990), however, suggests that consumers' lack of knowledge of the aspects of treated wood could lead to an unstable market. Their study concludes that "*...with no strong opinion regarding the physical risk of treated wood, consumers may be highly susceptible to bad publicity and negative advertisements concerning the safety of treated wood. This is clearly an undesirable situation for the treating industry*."

Wood Plastic Composites

A newer family of residential decking materials to appear in the marketplace has been technically classed as wood polymer composites (more commonly known as wood plastic composites, WPC). The first significant manufacturer of WPCs was Mobil Chemical Company's Composite Products Division, later spun-off from Mobile Chemical Company in 1999 and named Trex Company. Originally, the composite was marketed as Timbrex® and Rivenite®. The product was manufactured from recycled plastic grocery bags, industrial stretch film, sawdust from furniture factories, and used wooden pallets. Individually, these materials are broken down into their basic components, mixed together, and then formed into lumber dimensions utilizing an extrusion process. The extruded boards can be purchased in standard 2x2, 2x4, 2x6, 2x8, 2x10, 5/4x6, 4x4, 4x6, 6x6, and 6x8 dimensions. While Trex is not commonly stocked in all sizes at traditional lumber distribution centers and national Home Centers (e.g., Home Depot, Lowes, Menards), their distribution network is extensive enough that it can be ordered and quickly delivered with relative ease to any US market.

WPC deck material is significantly more expensive than treated lumber. Based on 2000 data, the average price of WPC deck material on a board foot basis was about $1.00, while treated wood exhibited an average price of $.53 per board foot. Demand at the consumer level has grown significantly during the past several years as the number of local suppliers (i.e., product availability) and consumer knowledge concerning WPC material has increased. The national market share for WPC materials in the deck market has increased from about 4% to nearly 19% between 1999 and 2003 (Eastin et. al. 2005). CINTRAFOR forecasts that the volume demand for WPC deck materials will grow 15% through 2008, with 2008 demand forecast to be 803 million board feet. The size of the WPC market in 2006 has been forecast at $900 million (Anonymous 2002).

WPCs were initially promoted to architects, builders, renovators, and municipalities as the primary targets for the product. However, promotion of WPC materials at the homeowner level has increased dramatically over the past few years as more competitors have entered the marketplace.

Most WPC manufacturers have been proactive in differentiating their product relative to substitute residential decking materials. Differentiating factors have included:

- Will not check, split, or rot
- Resistant to insect damage
- Resistant to UV damage
- Can be sawn, routed, sanded, nailed, drilled, and turned on a lathe
- Hold fasteners tighter than wood
- Readily accepts ordinary paints and stains
- Splinter-free
- Superior traction relative to solid wood
- Contains no preservative treatment
- Uses no virgin wood
- Made from reclaimed plastic and wood waste (environmentally friendly material)
- Product is 100% recyclable

WPCs have also been strongly promoted as being extremely consistent (as a material) relative to competing solid wood decking materials that require minimal maintenance.

WPCs do possess some negative characteristics. The most notable are the price of the product and, in some cases, availability at local suppliers. In addition, the weight of nearly all WPC materials is nearly twice that of lumber of the same dimension. As such, additional time is required to handle and install the product, resulting in increased labor costs. Due to the plastic composition of the product, WPCs are much more flexible than competing solid wood decking materials, and most WPCs cannot be used as structural elements. As a result, spacing between joists for most WPCs must be reduced to 12 inches on center rather than the standard 16 inches on center for solid wood surface decks, thereby increasing material costs for the deck understructure. Finally, there is some concern about the thermal characteristics of WPCs, particularly with respect to linear expansion and "softening" of the product in high temperature conditions.

Plastics

Another class of deck alternative materials is generally referred to as plastic deck material. These plastic materials are represented by vinyl and polyethylene; with polyethylene including both high density polyethylene (HDPE) and low density polyethylene (LDPE). Plastic deck materials have seen greater gains in deck accessories rather than in deck boards. The Freedonia Group (2002) attributes slower growth in the deck board market to builder reluctance to try new products that are considerably different from traditional deck board materials.

The market share of plastic deck materials in the US in 2003 was estimated to be approximately 1.2% on a board foot basis, or 75 million board feet (CINTRAFOR 2005). Approximately 55% of plastic deck material demand is represented by boards and 45% by railing systems and other deck accessories. About 90% of plastic deck materials are purchased by professional contractors and the remaining by do-it-yourself consumers. Demand for plastic deck materials is forecast to grow by slightly more than 12% through 2008, with most growth being accounted for by growing demand among professional contractors.

Plastic deck materials are expensive relative to deck material alternatives. The average price per board foot of plastic deck materials in 2000 was $2.11 (Freedonia Group 2002). Given the growth and variety of other deck materials in the market, and possible future excess capacity, it is expected that there will be increasing price pressure on plastic deck materials in the future.

Vinyl currently represents about 52% of the plastic decking material category on a board foot basis, followed by polyethylene at 33%, and the remaining 15% being other plastic-based products (e.g., plastic membrane and polypropylene). The demand for vinyl decking materials is expected to grow from 39 million board feet in 2000 to 63 million board feet in 2005, representing 61% growth over that time frame (Freedonia Group 2002).

Vinyl deck materials are generally manufactured from virgin polyvinyl chloride (PVC), but occasionally recycled PVC is used to produce vinyl deck materials. Vinyl is unique as a deck material alternative in that it is often sold as a complete system, including rails, spindles, boards, and other accessories. This assists the purchaser who is seeking one-stop shopping convenience and uniformity across the elements of the completed deck. Negative aspects of vinyl decks include appearance, which tends to be glossy and unlike most other deck materials, poor thermal expansion properties, longer installation time, and a substantially higher installed cost.

Polyethylene (PE) is expected to remain at about one-third of all plastic deck production through 2005 (Freedonia Group 2002). PE is marketed as an environmentally friendly product since it uses recycled materials in its production. It is also quite durable and requires little maintenance relative to other deck material alternatives. The primary negative attribute of PE decking is its poor thermal expansion properties, which over time can lead to considerable warping and splitting of the product, particularly when the product is used in high temperature locations. PE decking materials also possess very low bending strength properties, which require an increase in the number of joists used in the deck understructure to reduce the spacing between fastenings of the deck boards.

Market Share of Decking Products

To date, few studies have specifically examined the market share of residential decking products, Table 1. Research conducted by George Carter & Affiliates (1989a, p.9) led to the conclusion that "*56.6% of decking material sold is treated lumber. This is followed by cedar products with a combined market share of 23.3.*" However, a caveat to this conclusion states: "*The reader is reminded that a portion of the retailers and builders were selected by Fletcher Challenge distributors* [red cedar distributors]. *For this reason, there may be a built-in bias favoring cedar products.*" Reviewing other statistics and conclusions, the authors of this literature review believe that an upward bias on western red cedar products does indeed exist in the George Carter & Affiliates consulting report.

The most recent CINTRAFOR reports on the decking market were conducted in 2003 and 2005.. The results of this research are summarized in Table 2 and will constitute the basis for much of the remainder of the discussion on the US market for decking materials. However, this discussion will be supplemented with other market data when appropriate.

Table 1. National market share, on a volume basis, of residential deck materials as reported by various market research studies.

	Reported National Market Shares of Various Deck Materials, Percent			
Material	**1987 (George Carter & Affliates 1989a)**	**1999 (R.E. Taylor & Assoc. 2002)**	**2000 (Freedonia Group 2002)**	**2003 (Eastin et al. 2005)**
Treated Wood	82.5	83	77.4	56.6
Redwood	11.5	8	7.5	6.6
Western Red Cedar	3.2	6	6.5	7.8
Wood Plastic Composites	--[b]	3	5.0	18.8
Plastic	2.8	--	1.7	1.2
Untreated Wood	--	--	--	3.3
Tropical Hardwoods	--	1	--	1.8
Other	--	--	--	3.5

[a] Unpublished data resulting from a national survey of new home builders concerning their deck material use.
[b] Double dashes indicate that deck material was not assessed in the market research study.

Table 2. Summary characteristics of total US residential decking demand.

	2003	2008	% Change 2003-2008
Total Residential Demand (mmbf)	**3,060**	**3,415**	**11.6%**
Total Value ($millions)	**$2,480**	**$3,505**	**41.3%**
Wood	2,338 (76.5%)	2,390 (70%)	2.2%
Pressure-Treated	*1,732 (74.1%)*	*1,721 (72.0%)*	*-0.6%*
Redwood	*201 (8.6%)*	*143 (6.0%)*	*-28.9%*
W. Red Cedar	*239 (10.2%)*	*358 (15.0%)*	*49.8%*
Tropical Hardwoods	*56 (2.4%)*	*84 (3.5%)*	*50.0%*
Untreated Wood	*101 (4.3%)*	*84 (3.5%)*	*-16.8%*
WPC	575 (18.8%)	803 (23.5%)	40.0%
Plastic	37 (1.2%)	102 (3.0%)	175.7%
Other	107 (3.5%)	120 (3.5%)	12.1%
Construction Application			
New	1,065 (34.8%)	1,024 (30%)	-3.8%
Repair and Remodel	1,995 (65.2%)	2,391 (70%)	19.8%
Installer Type			
Home Builder	578 (18.9%)	512 (15%)	-11.4%
Deck Builder	1,937 (63.3%)	2,220 (65%)	14.6%
Homeowner (DIY)	545 (17.8%)	683 (20%)	25.3%
End-Use Application			
Substructure	1,454 (47.5%)	1,622 (47.5%)	11.6%
Deck Surface	1.454 (47.5%)	1,622 (47.5%)	11.6%
Rails	153 (5.0%)	171 (5.0%)	11.8%
Market Segment			
Residential	1,454 (65.6%)	--	--
Non-residential	1.454 (9.1%)	--	--
Non-building	153 (25.2%)	--	--

Source: CINTRAFOR, 2005

The data presented in Table 2 estimates that the demand for residential decking products will increase from 3.1 billion board feet (bbf) in 2003 to 3.4 bbf in 2008, an 11.6% increase over the five year period. This market expansion will not be distributed evenly across the three major types of deck materials, however. Whereas WPC materials are expected to increase by 40% and plastic materials by 176%, the demand for wood decking material is expected to increase by only 2.2%. Further, the demand for redwood is expected to decline by almost 30% between 2003-2008, although the decline in the demand for redwood lumber is attributed to supply constraints rather than declining demand. These demand outlooks are driven by two fundamental end-user attributes: durability (long-deck life) and low maintenance. Very little consideration was paid to price and price sensitivity of either new home builders or home owners. As a result, these demand estimates are more heavily weighted towards the higher priced substitute materials than the actual market situation might otherwise justify.

Table 2 also provides demand estimates for a variety of decking segments. The primary construction application for decking is repair and remodel (approximately 65%) followed by new home construction (approximately 35%). While the demand for decking products is expected to experience strong growth between 2003 and 2008, the sheer size of the repair and remodel market make it a much more attractive market segment for producers. In addition, new home builders are a much more price sensitive set of buyers compared to home owners given the nature of the project expenditures. In addition, decks on new homes tend to be smaller than repair and replacement deck projects.

Residential construction is the primary market for decking materials, followed by non-building projects (docks, marinas, park structures, etc.) and non-residential construction, Table 2. Perhaps more importantly, the demand for decking materials in the residential market is expected to grow by 24.3% between 2003 and 2008 while demand is expected to grow by just 6.9% in the non-building market. Again, specifiers in the non-building segment are much more price-sensitive given the nature of the bidding process in these types of projects.

Almost 80% of the decking material is installed by professionals as opposed to homeowners (DIY). While demand is expected to grow substantially in both segments, the highest growth is projected to occur within the DIY segment (25.3%) and the deck builder segment (14.6%) rather than the home builder segment (-11.4%). Given the profit constraints facing most home builders, this segment of the market tends to be more price sensitive than the DIY and deck builder segments. As a result, home builders subcontract out almost half of the decks that they build on new homes.

Finally, the deck market can be segmented into three end-use applications: the deck substructure, deck surface and deck railings, Table 2. It is important to note that we have assumed that approximately the same amount of material is used in the deck substructure as is used in building the deck surface. In contrast, just 5% of the total material is used in deck railings, a figure that is influenced by the fact that many non-wood railing systems (e.g., glass panels, metal railings and cable railing systems) are used with wood decks.

Distribution Channels for Residential Decking Products

Except for treated wood, there has been no study conducted to determine the channels of distribution used for the different types of decking materials. Given that a significant number of decks are built by do-it-yourself homeowners, however, it is likely that the predominant distribution agents are retailers such as local lumberyards and home centers (e.g., Home Depot, Lowes, Menards).

In a survey of professional contractors and remodelers, Smith and Sinclair (1990) found that 84% of treated lumber was purchased through retailers. Wholesalers supplied 13% of this market, while treating facilities supplied 3%. They also found that builders in the US West purchased a greater amount of their treated wood from wholesalers (26%) and less from retailers (73%).

Decking Lumber Price Trends

The prices for two primary wood decking materials are tracked in Figure 25. The price data illustrates several interesting characteristics of the wood decking market. First, the data clearly shows that decking prices are cyclical and seasonal, increasing during the late spring to early autumn as the weather becomes warmer and drier through the US. As noted earlier, this is also the season when new residential construction also peaks and demand for wood decking materials, both in new construction and the R&R sector, increase substantially. Second, the price data clearly shows that while western red cedar decking prices increased by approximately 57% over the period 1992-2003, prices for SYP preservative treated decking actually declined by approximately 6.1% during the same period.

Third, and lastly, Figures 25 and 26 suggest that the price data can be broken into two time periods. Time Period 1 occurs prior to the imposition of the Canada-US Softwood Lumber Agreement (SLA) while Time Period 2 shows the price trends after the imposition of the SLA. It should be noted that the volume of WRC lumber imported from Canada annually is approximately equivalent to the volume of WRC lumber produced domestically. As shown in Figure 25, the SLA resulted in a decline in Canadian western red cedar imports into the US, and contributed to a steep increase in WRC decking prices in the short-term. These price increases occurred as the percentage of houses built with a deck declined from 34% (1996) to 29% (2002). The combination of reduced supply and reduced demand initially caused a sharp decline in both WRC and SYP prices between March and October of 1998. However, tight supplies of WRC and over-production of SYP in the US south eventually contributed to an

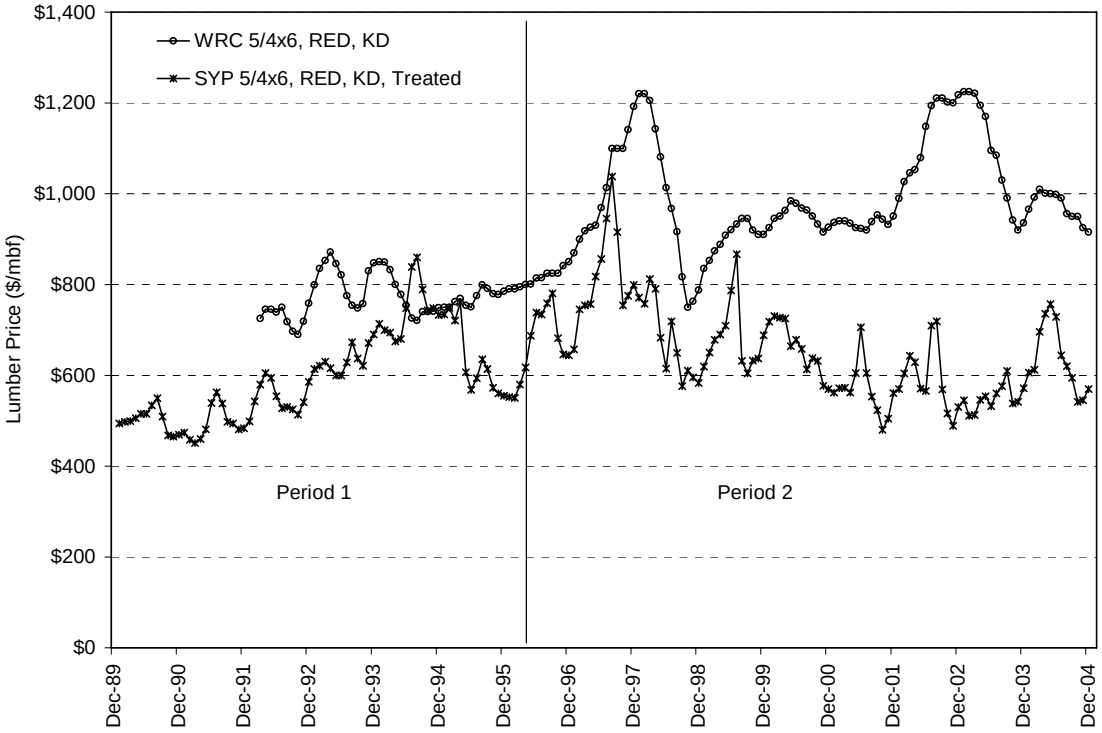

Figure 25. Prices for western red cedar and yellow pine decking products.
Source: Random Lengths, various editions.

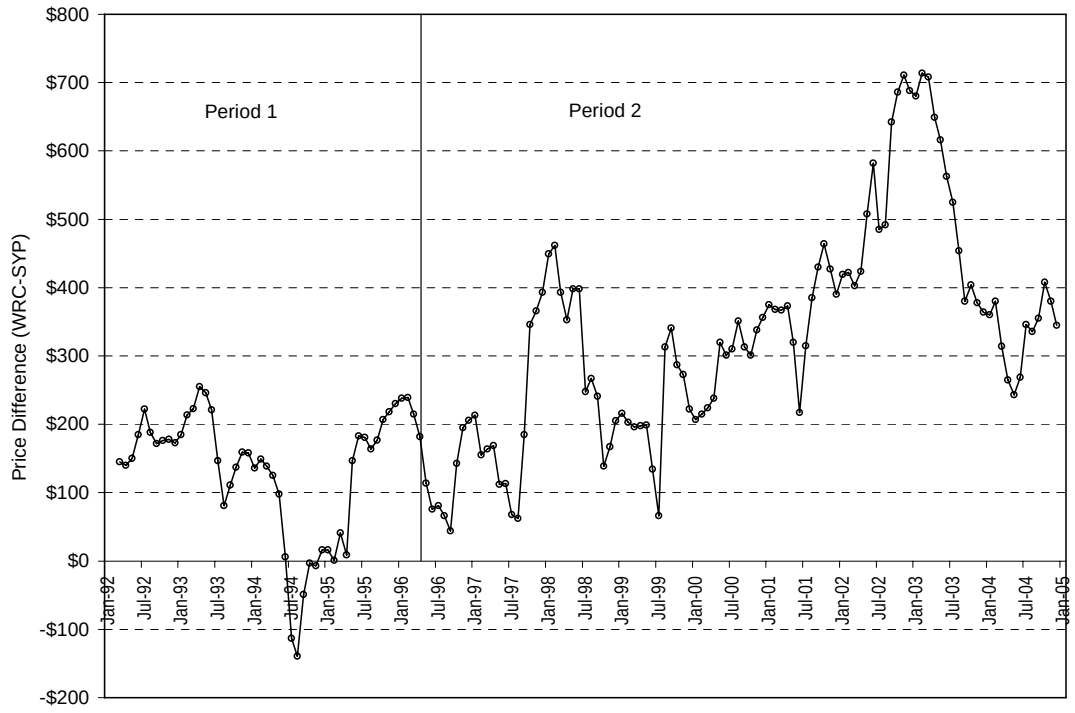

Figure 26. Price differential between western red cedar and yellow pine decking lumber.
Source: Random Lengths, various editions.

increasing price disparity between the two products over the period 1999-2003, Figure 26. There has been some moderation in both WRC and SYP prices over the past 6 months and the price disparity between WRC and SYP has declined substantially as a result.

The consistent price discrepancy between WRC and SYP suggests that the market intrinsically places a higher value on WRC lumber in outdoor applications. However, it is also true that the artificial supply constraints caused by import restrictions on WRC decking products and harvest restriction in the US west have exacerbated the price discrepancy between WRC and SYP decking.

Factors Influencing Preferences for Residential Decking Products

The literature pertaining to residential decking material was thoroughly examined in order to inventory the factors that were thought to influence the residential decking planning and purchase process. Factors were categorized into three distinct groups of decision makers: the wholesaler/retailer, the builder/contractor/designer, and the homeowner/do-it-yourself decision makers.

Within each of the three categories of decision makers, the factors were further broken down into four general domains, the first being designated as the *product qualities* domain. The items listed in this first domain tend to be factors that a producer of decking would have little control over in terms of product design. The second set of factors was designated as the *economic* domain. These items tend to be factors related to price and costs (e.g., maintenance costs, installation costs). The third set of factors was designated as the *manufacturer services* domain. In this domain, items tended to deal with factors that the manufacturer had considerable amount of control to change the existing consumer perception of the factor (e.g., product availability, promotional material provided by manufacturer). The final set of factors was designated as the *consumer perception* domain. Items listed in this domain tend to be factors that are strongly held beliefs of consumers with regard to the decking material itself. The factors in this last domain are frequently cited as being consumer perceptions that are strongly held and difficult to change.

Research conducted by George Carter & Affiliates (1989a) was the only source of information found examining wholesaler and retailer perceptions of residential decking materials. In their study, summarized in Table 3, it was found that wholesalers and retailers were mostly concerned with the services that could be provided by the manufacturer of the decking material. Factors such as product and grade consistency, size variety, on-time delivery of products, and product pretreatment were all considered to be of the greatest importance to retailers and wholesalers. Also considered very important to these individuals was the manufacturer's promotion of the product at the consumer level.

Table 3. Factors influencing wholesaler/retailer preferences for residential decking materials.

Factor	Reference
Product Qualities	
Tighter Knots	George Carter & Affiliates 1989a
Economic	
Competitive and Consistent Price	George Carter & Affiliates 1989a
Manufacturer Services	
Product and Grading Consistency	George Carter & Affiliates 1989a
Size Variety	George Carter & Affiliates 1989a
On-time Delivery	George Carter & Affiliates 1989a
Packaging	George Carter & Affiliates 1989a
Product Knowledge	George Carter & Affiliates 1989a
Product Promotion by Manufacturer	George Carter & Affiliates 1989a
Accessories of Same Species Available	George Carter & Affiliates 1989a
Pretreatment	George Carter & Affiliates 1989a
Consumer Perceptions	
Natural Material	George Carter & Affiliates 1989a

The George Carter & Affiliates report suggested that wholesalers and retailers were somewhat concerned about price stability. The perceptions of price, however, were not fully explored in their study. In addition, product qualities and consumer perceptions that directly influence wholesaler and retailer perceptions of residential decking materials were also not fully researched.

Factors influencing the perceptions of builders, contractors, and designers with regard to residential decking products can be found in Table 4. It should be noted, however, that some bias does exist in each of the studies in Table 4. First, the research conducted by Sinclair and Smith was primarily concerned with perceptions toward treated lumber. Second, research carried out by George Carter & Affiliates was biased toward western red cedar products due to the sampling method that was employed in their study.

Manufacturer and retailer services factors were found to be the most important group of factors influencing the perceptions of builders, contractors, and designers in the residential decking market. For instance, product and grading consistency, product availability, warranties and guarantees, and whether the product was branded or not were found to significantly influence perceptions. Interestingly, a large number of factors influencing the perceptions of builders, contractors, and designers dealt with physical aspects of the decking products that could be easily changed by the manufacturer. These included product variety, delivery of material, size variety, moisture content, general appearance, surface cleanliness, radius edged boards, and precision square cut ends.

Research by Shook and Eastin (2001) found that residential contractors were most concerned with the long life, durability, and aesthetics of deck materials when constructing a new home with a deck. Material strength properties, material waste, and material cost were found to be relatively unimportant to these same contractors.

Consumer perceptions that builders, contractors, and designers felt influenced their perceptions of residential decking materials were mostly concerned with product safety issues; most notably with treated lumber. These consumer perception factors included disposal of waste material, handling safety, safety for outdoor applications, and risk to children.

Table 4. Factors influencing builder/contractor/designer preferences for residential decking materials.

Factor	Reference
Product Qualities	
Aesthetically Pleasing	Shook and Eastin 2001
Inhalation of Sawdust	Sinclair and Smith 1990
Easy to Maintain	Shook and Eastin 2001
Consistent Material Quality	Shook and Eastin 2001
Odor Emissions	Sinclair and Smith 1990
Fade Resistant	George Carter & Affiliates 1989a
Structural Properties	George Carter & Affiliates 1989a; Shook and Eastin 2001
Durability	George Carter & Affiliates 1989a; Shook and Eastin 2001; Sinclair and Smith 1990
Susceptibility to Wear	George Carter & Affiliates 1989a
Straightness	Smith and Sinclair 1990
High Workability	Shook and Eastin 2001
Manufacturer/Retailer Services	
Product Availability	George Carter & Affiliates 1989a; Shook and Eastin 2001
Product and Grading Consistency	George Carter & Affiliates 1989a; Smith and Sinclair 1990
Branded Product	Sinclair and Smith 1990; Smith and Sinclair 1990
Dealer Reputation	Smith and Sinclair 1990
Knowledgeable Salespeople	Smith and Sinclair 1990
Price Incentives/Material Cost	Shook and Eastin 2001; Smith and Sinclair 1990
Price Stability (low volatility)	Shook and Eastin 2001
Warranty/Guarantee	George Carter & Affiliates 1989a; Smith and Sinclair 1990
Product Knowledge	George Carter & Affiliates 1989a
Product Variety	Smith and Sinclair 1990
Convenient Distribution Location	Smith and Sinclair 1990
Delivery of Material	Smith and Sinclair 1990
Retailer Service and Promotion	Smith and Sinclair 1990
Color Selection	Smith and Sinclair 1990
Size Variety	George Carter & Affiliates 1989a
Moisture Content	Smith and Sinclair 1990
Quality Mark	Smith and Sinclair 1990
Chemically Treated	Sinclair and Smith 1990
Chemical Retention Level	Smith and Sinclair 1990
Kiln-Dried After Treatment	Smith and Sinclair 1990
Long Lengths	George Carter & Affiliates 1989a
General Appearance	Shook and Eastin 2001; Smith and Sinclair 1990
Surface Cleanliness	Smith and Sinclair 1990
Pretreated	George Carter & Affiliates 1989a
Radius Edged	George Carter & Affiliates 1989a
Precision Square Cut Ends	George Carter & Affiliates 1989a
Consumer Perceptions	
Disposal of Waste Material	Shook and Eastin 2001; Sinclair and Smith 1990
Handling Safety	Sinclair and Smith 1990
Safe for Outdoor Applications	Sinclair and Smith 1990
Risk to Children	Sinclair and Smith 1990

A list of factors influencing homeowner and do-it-yourself consumer perceptions of residential decking materials can be found in Table 5. These factors were found to be similar to the factors influencing builder, contractor, and designer perceptions. Perhaps the similarity is not surprising given that a large proportion of the decks that are built are completed by the homeowner.

Homeowners and do-it-yourself consumer perceptions of decking materials appear to be most influenced by manufacturer and retailer services provided with the sale of such materials. This is advantageous to manufacturers since the factors dealing with services provided by manufacturers and retailers are the most easily adjustable relative to factors dealing with product quality, economics, and consumer perceptions.

The homeowner and do-it-yourself segment also appears to be more concerned with safety issues than builders, contractors, wholesalers, and retailers. Research by Sinclair and Smith (1990) revealed that this segment was concerned with disposal issues, handling safety, and risk to children and animals. It should be noted again, however, that Sinclair and Smith were investigating the treated lumber market.

Results of Previous Residential Decking Preference Studies

Only four research papers were found in the literature that specifically examine the preferences and opinions of individuals toward various residential decking materials. George Carter & Affiliates (1989a, 1989b) examined treated lumber, redwood, and western red cedar decking materials. Meanwhile, Smith and Sinclair (1989, 1990) examined consumer and builder perceptions toward treated lumber. Finally, Shook and Eastin (2001) surveyed builders' perceptions of seven different types of deck materials. A brief summary of results of these four studies follows in this section.

In a document prepared for Fletcher Challenge Canada, George Carter & Affiliates (1989a, 1989b) report on the decking markets in North America. Specifically, the objective of their research was "*to talk to a cross section of builders and retailers to determine what they use or sell, their attitudes and perceptions of cedar products, and to search for product modifications or elements of service that would enhance the products currently offered by Fletcher Challenge.*"

For retailers, George Carter & Affiliates summarize:

- Decking manufacturers can distinguish themselves most with retailers by providing a material of consistent quality. On-time delivery and product promotion were cited as the second and third most important means for manufacturers to distinguish themselves.
- Roughly 20% of retailers would pay extra for improvements to cedar decking products.
- Few suggestions were suggested to make decking grade lumber more desirable, other than to maintain consistent product quality, sell material with tighter knots, and sell it in longer lengths.
- Suggested changes for services and packaging included the development of "how to" books on building and finishing, color brochures displaying deck designs, and explanations of differing grades of lumber and how and when to use them.

Table 5. Factors influencing homeowner/do-it-yourself consumer preferences for residential decking materials.

Factor	Reference
Product Qualities	
Odor Emissions	Sinclair and Smith 1990
Burnable	Sinclair and Smith 1990
Durability	Sinclair and Smith 1990
Inhalation of Sawdust	Sinclair and Smith 1990
Fire Resistant	D.G. Bell & Associates 1986
Straightness	Smith and Sinclair 1989
Economic	
Final Installed Price	D.G. Bell & Associates 1986; Smith and Sinclair 1989
Manufacturer/Retailer Services	
Product Availability	D.G. Bell & Associates 1986
Product and Grade Consistency	Smith and Sinclair 1989
Branded Product	Sinclair and Smith 1990; Smith and Sinclair 1989
Dealer Reputation	Smith and Sinclair 1989
Price Incentives	Smith and Sinclair 1989
Warranty/Guarantee	Smith and Sinclair 1989
DIY Plans	Smith and Sinclair 1989
Quality Mark	Smith and Sinclair 1989
Surface Cleanliness	Smith and Sinclair 1989
Chemical Retention Level	Smith and Sinclair 1989
Kiln-Dried After Treatment	Smith and Sinclair 1989
Moisture Content	Smith and Sinclair 1989
Product Variety	Smith and Sinclair 1989
Convenient Distribution Location	Smith and Sinclair 1989
Delivery of Material	Smith and Sinclair 1989
Color Variety	D.G. Bell & Associates 1986; Smith and Sinclair 1989
Chemically Treated	Sinclair and Smith 1990
Retailer Service and Promotion	Smith and Sinclair 1989
Knowledgeable Salespeople	Smith and Sinclair 1989
Consumer Perceptions	
Disposal of Waste Material	Sinclair and Smith 1990
Handling Safety	Sinclair and Smith 1990
Safe for Outdoor Applications	Sinclair and Smith 1990
Risk to Children	Sinclair and Smith 1990
Risk to Animals	Sinclair and Smith 1990
Meets Building Code Requirements	D.G. Bell & Associates 1986

Most retailers did not consider home centers a threat to decking material sales. However, those retailers that did see home centers as a threat felt that they were losing sales due to lower prices and heavier advertising by home centers.

For builders, the following summary was made:

- Builders preferred deck lumber that was 6-inches wide, 16-feet long, and either 2-inches or 5/4-inches thick.
- Builders stressed the importance of having at least one face and edge with sound tight knots.
- Few suggestions were made to improve cedar decking other than to treat it to make it more durable.
- No suggestions were aimed at changing service or packaging that would help decrease the construction time for the builder or to improve the installation method.
- Interest was expressed among builders to develop technical and deck design information.

The conclusion drawn in the George Carter & Affiliates (1989a) report was far from encouraging. Specifically, it was stated (p.15) that "*There appears to be very little opportunity for creating a truly unique decking product that allows a manufacturer to stand out from the crowd. Too few builders express interest in any kind of feature that would allow a manufacturer to focus on as a marketable attribute*."

Articles by Smith and Sinclair (1989, 1990) examined consumer and builder perceptions toward treated lumber. The perceptions of professional contractors and remodelers, as well as do-it-yourself consumers, toward CCA-treated lumber products were examined in their articles. Ratings of selected product attributes were reported and are summarized in Table 6. A summary of ratings of selected service attributes are summarized in Table 7.

The results reported in Smith and Sinclair's articles led them to develop several strategic recommendations that manufacturers of treated lumber could follow. From the professional contractor and remodeler perspective, it was suggested that manufacturers increase usage among current users through innovative product modifications. Additionally, they recommend that the existing customer base for treated lumber could be protected through increased brand or company loyalty. Loyalty would be achieved by having the manufacturer stress the company or brand differences and brand benefits relative to alternative products, materials, or competitors. Finally, they recommend an aggressive defensive strategy against competitors producing substitutes such as natural durable species (i.e., western red cedar, redwood). In this case, they suggest (p.14) that a manufacturer's defensive strategy consist of active promotional programs such as "*in-store presentations, advertising, improved service, and new product development such as radius edged decking, deck kits, or color tints*."

Table 6. Ratings of selected CCA-treated lumber product attributes by professional contractors/remodelers and do-it-yourself consumers.

Product Attribute	Professional Contractor/Remodeler Rating of Product Attribute[a,b]	Do-It-Youself Consumer Rating of Product Attribute[c]
Straightness	4.47	4.72
General Appearance	3.85	4.29
Price	3.83	4.12
Grade	3.82	4.22
Surface Cleanliness	3.47	4.05
Chemical Retention Levels	3.45	3.69
Kiln Dried After Treatment	3.30	3.67
Moisture Content	3.24	3.85
Quality Mark	2.99	3.71
Species	2.77	3.49
Color	2.57	2.99
Brand Name	2.28	2.98

[a] Attributes were rated on a five point Likert-like, where 1 = not important at all and 5 = extremely important.
[b] Number of responses for professional contractors/remodelers was 434 from a survey with a 18% response rate.
[c] Number of responses for do-it-yourself consumers was 302 from a survey with a 17% response rate.
Source: Smith and Sinclair (1989, 1990)

Table 7. Ratings of selected CCA-treated lumber service attributes by professional contractors/remodelers and do-it-yourself consumers.

Service Attribute	Professional Contractor/Remodeler Rating of Service Attribute[a,b]	Do-It-Youself Consumer Rating of Service Attribute[c]
Pressure Treated Product Variety	3.52	4.09
Convenient Location	3.44	3.99
Short Delivery Lead Times	--	3.97
Delivery Service	2.76	--
Warranty	3.03	3.93
Dealer Reputation	--	3.85
Store Reputation	3.37	--
Price Incentives	3.17	3.74
Knowledgeable Salespeople	3.54	3.72
Promotional Materials	2.58	3.01
DIY Plans	3.08	--

[a] Attributes were rated on a five point Likert-like, where 1 = not important/very unimportant at all and 5 = extremely important/very important.
[b] Number of responses for professional contractors/remodelers was 434 from a survey with a 18% response rate.
[c] Number of responses for do-it-yourself consumers was 302 from a survey with a 17% response rate.
Source: Smith and Sinclair (1989, 1990)

From the do-it-yourself consumer perspective, Smith and Sinclair suggest that efforts be made to improve the appearance of treated lumber, which would ultimately lead to improved customer satisfaction and increased demand. Second, they suggest that a brand be developed in which the variability in appearance within a grade is minimized - with the product having a uniform, high end appearance. Finally, they suggest that retailers should have a sales force that has knowledge of treated lumber and the applications in which treated lumber can be utilized.

Sinclair and Smith (1989, 1990) also had survey participants rate several opinion statements regarding treated lumber. The results of these opinion statement ratings are summarized in Table 8. The results in this table provide two points of interest that should be noted. The first point is somewhat technical, but crucial in interpreting the results accurately. The scale used in this survey was balanced. In other words, a rating of 3.00 essentially means that the respondent, or in this case the average score of all survey respondents, neither agreed nor disagreed with the opinion statement. Unfortunately, Smith and Sinclair failed to perform a specific statistical test that could have easily determined whether the aggregate response score to the opinion statements were significantly different than a neutral response of 3.00. As such, we have no way of determining whether the aggregate response scores for each opinion statement were in the positive (i.e., strongly agree) or negative (strongly disagree) direction. Therefore, the results shown in Tables 6, 7, and 8 should be interpreted with caution.

Table 8. Ratings of opinions of CCA-treated lumber products by professional contractors/remodelers and do-it-yourself consumers.

Opinion	**Professional Contractor/Remodeler Rating of Opinion[a,b]**	**Do-It-Yourself Consumer Rating of Opinion[c]**
Will pay more for higher quality/appearance treated lumber	3.69	3.60
Am satisfied with quality/appearance of treated lumber	--	3.51
Brand named treated lumber is generally of superior quality	3.24	3.14
Retail salespeople are knowledgeable about treated lumber	2.51	2.99
Will pay more for brand named treated lumber	2.92	2.92
More concerned with appearance than grade or species of treated lumber	3.07	2.80
Will pay more for treated lumber versus cedar/redwood	--	2.73
Will pay more for kiln dried after treatment treated lumber	3.44	--

[a] Attributes were rated on a five point Likert-like, where 1 = strongly agree at all and 5 = strongly disagree.
[b] Number of responses for professional contractors/remodelers was 430 from a survey with a 18% response rate.
[c] Number of responses for do-it-yourself consumers was 464 from a survey with a 17% response rate.
Source: Smith and Sinclair (1989, 1990)

The second point that should be made concerns the comparison of the scores of professional contractors & remodelers with those of do-it-yourself consumers. The surveys instruments used to evaluate these two groups of consumers of treated lumber products contained subtle but noticeable differences. Therefore, it is suggested that direct comparisons between the two groups of consumers be made with caution since the respondents were completing their surveys under slightly differing conditions.

Research by Shook and Eastin (2001) provides the most recent information concerning residential contractor perceptions of alternative deck materials. Of note in this study is that the researchers examined the importance that residential contractors place on various material attributes when the material is used as a deck surface or accessory (Table 9). With regard to region of operation, only one material attribute was found to differ among the four regions of the US. Specifically, residential contractors in the northwest and southwest were less concerned with product availability than their counterparts operating in the northeast and southeast. Also, small residential contractors assigned significantly more importance to the aesthetics of the deck material than did large residential contractors.

Table 9. Importance ratings for various deck material attributes when material is used as a deck surface or accessory.

	Importance of Material Attribute When Used as Deck Surface or Accessory[a,b,c]										
	Long Life	**Beautiful & Aesthetically Pleasing**	**Durability**	**Consistent Material Quality**	**Availability**	**Easy to Maintain**	**High Workability**	**Price Stability**	**High Strength Properties**	**Little Material Waste**	**Low Material Cost**
Region[d]											
Northeast	6.43	6.44	6.32	6.29	6.41[a]	5.78	6.00	5.94	5.77	5.50	5.31
Southeast	6.23	6.08	6.12	6.02	6.01[a]	5.86	5.66	5.69	5.77	5.58	5.42
Northwest	6.28	6.35	6.02	6.01	5.88[b]	5.82	5.60	5.49	5.38	5.21	5.02
Southwest	6.39	6.36	6.03	6.03	5.84[b]	5.85	5.69	5.66	5.37	5.37	5.39
Firm Size[e]											
Small	6.35	6.35[a]	6.08	6.09[a]	6.01	5.73	5.74	5.54	5.51	5.34	5.06
Large	6.21	6.14[a,b]	6.10	6.06[a]	6.08	5.73	5.69	5.84	5.71	5.47	5.62
Top 100	6.18	5.75[b]	5.82	5.39[b]	5.68	5.43	5.36	5.54	5.00	4.89	5.79
All Firms	6.32	6.27	6.09	6.02	6.00	5.72	5.70	5.67	5.51	5.35	5.30

[a] Utilizing a Likert-type scale ranging from 1 (Not Important At All) to 7 (Extremely Important) and containing a midrange value of 4 (Neutral), survey participants were asked to answer the following question for 11 attributes: "How important are the following building material attributes when building deck surfaces and accessories?"

[b] Comparison of means across subgroups (i.e., column data) is represented by alphabetic notations (Scheffe's contrast test, 0.05 α-level). Subgroups with statistically identical means share the same letter; the lack of alphabetic notations indicates that the means were statistically similar across all subgroups.

[c] Deck accessories mentioned in the survey included railings, stair treads, and benches.

[d] Builder 100 firms were excluded from the regional summary since most reported operating within multiple states and regions.

[e] Small firms were defined as having 1997 gross sales revenue of $1 million or less, while large firms had 1997 gross sales revenue greater than $2.5 million (large firm data excludes Builder 100 firms).

SURVEY METHODOLOGY

A survey was used to supplement the secondary data obtained through the literature review and to provide primary data on the decking markets. Two distinct populations were surveyed: residential home builders and deck builders. Based on the time constraints for the project and ensuring the adherence to developing a proper sampling frame, two different data collection methods were adopted for the homebuilders and the deckbuilders. The sample size for each target population was established at 200 residential home builders and 200 deck builders. The sample size was strongly influenced by a combination of the total budget and the time constraints of the project. Two different sample frames and survey methods were adopted for gathering information from these two distinct populations, which is explained in the following section. A copy of each surveys is provided in Appendices A and B.

Survey Methodology for the Homebuilders

The geographic focus of the survey was the US, with an equal number of respondents from both the eastern and western US (as divided by the Mississippi river). A systematic random sampling was undertaken in order to ensure a proper representation of all the states of US. The number of responses from each state was proportional to the number of housing starts in each state relative to total US housing starts.

It was determined that a telephone survey would be the most efficient way to collect data from the homebuilders. A local market research company was chosen to conduct the telephone survey because of their experience in conducting telephone surveys for a wide variety of forest products' companies and because their interviewers are very familiar with the range of wood products included in the surveys. The initial survey was developed by CINTRAFOR and were reviewed and revised by cooperating researchers in the USDA Forest Service Wood Utilization Lab in Sitka. The revised survey was then pre-tested during telephone interviews with a small sub-sample of the target populations. Following the pre-tests, minor edits were made to the survey to improve its clarity.

The sample frame for the target population was obtained from INFOUSA through a systematic random sampling based in the homebuilder SIC code. The sampling was done by making the sample representation from each state proportional to housing starts in that particular state in the year 2003, Table 10. The sample size was established at 205 respondents.

Telephone surveys were conducted during the fall of 2004. Survey responses were marked on the survey sheet by the interviewer along with any comments made by the respondents. A total of 213 eligible homebuilders were successfully interviewed. However, due to large number of non responses, one of the surveys was discarded. The survey responses were then entered into a statistical database (SPSS version 12).

Survey Methodology for the Deckbuilders

A different survey methodology was adopted for collecting information from the deckbuilders. In this case, questionnaires were distributed along with the May-June 2004 issue of the "Professional Deckbuilder Magazine", as an insert. A brief introduction to the questionnaire was included in the Editorial section of the magazine. The objective of the research project was introduced on the cover page of the survey along with a request from the Editor of the Professional Deckbuilder Magazine to complete and return survey. The information requested in the survey was very similar to that for the homebuilder survey, although the structure of the questions was modified slightly to suit the different survey method. The initial survey questions were developed by CINTRAFOR and were reviewed and revised as described in the previous section. The revised surveys were then pre-tested with a small sub-sample of the target population and necessary modifications were made to improve the clarity of a few questions.

In this case the sampling frame was decided by the circulation of the magazine. The magazine has 15,000 subscribers, evenly distributed across the US. The target readers of the magazine are professional deckbuilders. Surveys were included in half of the magazines mailed out. An e-mail reminder was sent by the Editor of Professional Deckbuilder reminding their subscribers to complete and return the survey, approximately one month following the publication of the magazine.

The survey responses were then entered into a statistical database (SPSS version 12). Summary frequencies were run to ensure that all data was entered correctly. A statistical analysis of the survey data was then conducted. The

results of this analysis are presented in the following section of the report. While the results of the statistical analyses are presented in the tables and figures that follow, the emphasis of the discussion is targeted towards identifying the information that has the greatest strategic importance with regards to Alaska yellow cedar and its competitive position and potential market opportunities in the decking market.

Table 10. Sampling framework for Alaska yellow cedar market research project.

Western US	Housing Starts	% of US Starts	# of Respondents to call per state	Eastern US	Housing Starts	% of US Starts	# of Respondents to call per state
California	159,573	9.13	18	Maine	7,201	0.41	1
Arizona	66,031	3.78	8	New Hampshire	8,708	0.50	1
Nevada	35,615	2.04	4	Vermont	3,072	0.18	1
Oregon	22,186	1.27	3	Massachusetts	17,465	1.00	2
Washington	40,200	2.30	5	Rhode Island	2,848	0.16	1
Idaho	13,488	0.77	2	Connecticut	9,731	0.56	1
Montana	3,574	0.20	1	New Jersey	30,441	1.74	3
Wyoming	2,045	0.12	1	Delaware	6,331	0.36	1
Utah	19,327	1.11	2	Maryland	29,293	1.68	3
North Dakota	3,265	0.19	1	Washington DC	1,591	0.09	1
South Dakota	4,816	0.28	1	Virginia	59,445	3.40	7
Nebraska	9,278	0.53	1	North Carolina	79,824	4.57	9
Kansas	12,983	0.74	1	South Carolina	34,104	1.95	4
Oklahoma	12,979	0.74	1	Georgia	97,523	5.58	11
Texas	165,027	9.44	19	Florida	185,431	10.61	21
Colorado	47,871	2.74	5	New York	49,149	2.81	6
New Mexico	12,066	0.69	1	Pennsylvania	45,114	2.58	5
Minnesota	38,977	2.23	4	West Virginia	4,890	0.28	1
Iowa	14,789	0.85	2	Michigan	49,968	2.86	6
Missouri	28,255	1.62	3	Ohio	51,246	2.93	6
Arkansas	12,436	0.71	1	Indiana	39,596	2.27	5
Louisiana	18,425	1.05	2	Kentucky	19,459	1.11	2
Alaska	3,003	0.17	1	Tennessee	34,273	1.96	4
Hawaii	5,902	0.34	1	Alabama	18,403	1.05	2
				Mississippi	11,276	0.65	1
				Wisconsin	38,208	2.19	4
				Illinois	60,971	3.49	7
Total West	***752,111***	**43**	**89**	***Total East***	***995,561***	**57**	**116**

(Based on 2003 housing starts)

RESULTS AND DISCUSSION

The preliminary discussion of the survey results will begin with a summary of the demographic information derived from the survey. This will be followed by a summary of the general survey results. The results obtained from each question on the survey will be presented in the same order that the question was asked in the survey.

Survey Demographics

The demographic information derived from the surveys is presented in Tables 11-18. Just over 60% of deck contractors build decks as their primary line of work while a quarter of deck builders also build homes, Tables 11 and 12. In contrast, almost 90% of home builders are primarily involved in building single-family homes while just 1% build decks as their primary line of business.

Previous research by CINTRAFOR has found that the vast majority of firms in the deck building and residential construction industries are small to medium-sized firms, a finding confirmed by this research, Table 13 and 14. Approximately 90% of deck builders and 80% of residential contractors have annual sales of $5 million or less. Small firms, defined as having annual revenue below $1 million represented a substantial segment of the sample frame, representing approximately two-thirds of deck builders and one-third of home builders.

Home Builders

Table 15 provides a detailed description of residential construction project information for home builders. The vast majority of the respondents indicated that they are primarily building residential homes. Builders indicated that they built almost three times as many spec homes as custom homes. The data shows that custom homes are more likely to be built with a deck and that these decks are 35% larger and 150% more expensive than decks built for spec homes. The difference in each of these attributes was found to be significant between spec homes and custom homes. Finally, home builders reported that they used subcontractors to build almost half of the decks they put onto their new homes.

Further analysis of the home builder survey data was performed to identify differences based on geographic location, Table 16. While the size of decks built for spec homes was about the same across all three regions, decks on custom homes on the west coast were almost double the size of those built in the east. In addition, the cost of decks built along the west coast (both spec and custom) was significantly higher than those built in the interior west and the eastern US. Builders in the eastern US tended to subcontract out a higher percentage of their deck projects relative to western builders.

Table 11. Primary type of work done by deck builders.

	Percentage
Deck Builder	60.3
Deck Designer	16.0
Wholesale Company	6.4
Retail Company	14.7
Manufacturer	4.5
Home Builder/Contractor	24.4
Other	10.3

Table 12. Primary type of work done by home builders.

	Percentage
Single family construction	88.6
Multi-family construction	2.9
Non-residential construction	1.3
Repair and remodel	5.5
Deck/Porch building	1.0

Table 13. Approximate sales revenue reported by deck builders in 2003.

	Percentage
0 - $100,000	11.7
$100,001 - $250,000	16.6
$250,001 - $500,000	24.1
$500,001 - $1,000,000	11.0
$1,000,001 - $2,000,000	10.3
$2,000,001 - $3,000,000	7.6
$3,000,001 - $5,000,000	6.9
Over $5,000,000	11.7

Table 14. Approximate sales revenue reported by home builders in 2003.

	Percentage
0 - $500,000	11.2
$500,001 - $1,000,000	21.9
$1,000,001 - $2,500,000	27.5
$2,500,001 - $5,000,000	20.8
$5,000,001 - $10,000,000	9.6
$10,000,001 - $20,000,000	2.2
Over $20,000,000	6.7

Table 15. Home builder demographic information.

Average percentage of spec homes with deck	54.5%
Average percentage of custom homes with deck	73.6%
Average size of decks on spec homes	362.2 ft^2
Average size of decks on custom homes	490.8 ft^2
Average cost of decks on spec homes	$3,900
Average cost of decks on custom homes	$5,984
Average number of spec homes built	35
Average number of custom homes built	12
Average percentage of decks subcontracted	45.8

Table 16. Home builder demographics by region.

	East	Interior West	West Coast
Spec Home w/Deck	63.0%	39.6%	51.7%
Custom Home w/Deck	75.9%	71.0%	71.8%
Size of Spec Deck	345.9 ft^2	383.2 ft^2	362 ft^2
Size of Custom Deck	375.1 ft^2	486.3 ft^2	743 ft^2
Average Cost of Spec Deck	$3,267	$3,288	$6,582
Average Cost of Custom Deck	$4,737	$6,166	$8,675
Percent Decks Subbed Out	51.2%	42.4%	39.0%

Sample size (East=40-99; West excl. coast=20-57; West Coast=14-50)

Table 17. Deck builder demographic information.

Average size of decks built	456 ft^2
Number of decks built in 2003	93
Average total construction cost of decks built	$6,161
Average construction cost of deck structure	34.2% ($2,108)
Average construction cost of deck surface	45.1% ($2,776)
Average construction cost of deck accessories	21.2% ($1,306)
Average % of new decks built on existing home	42.2%
Average % of new decks built on new home	25.2%
Average % of repair/replacement decks built	31.9%
Average number of years firm has been in business	17.8 years

Table 18. Deck builder demographics by region.

	East Coast	Interior West	West Coast
Ave. deck size	395 ft^2	553 ft^2	513 ft^2
Number of decks built	126	65	42
Ave. construction cost	$5,851	$4,524	$8,019
Ave. construction cost/sq. ft.	$14.81	$8.18	$15.63
Deck structure	34.2% ($2,001)	35.0% ($1,583)	31.7% ($2,542)
Deck surface	43.9% ($2,569)	47.4% ($2,144)	46.6% ($3,737)
Deck accessories	21.9% ($1,281)	17.6% ($796)	21.7% ($ 1,740)
Decks on existing home	41.6%	43.7%	42.4%
Decks built on new home	27.9%	27.0%	45.7%
Repair/replacement decks	30.5%	25.5%	11.9%

Sample sizes (East=64-81; West excl. coasts=16-28; West Coast=24-39)

Deck Builders

The deck building industry is dominated by small to medium-sized firms with over 63% of survey respondents indicating that their sales revenue was less than $1 million in 2003. In contrast, over 11% of deck builders generated sales revenue in excess of $5 million. The average deck builder constructed 93 decks with an average deck size of 456 square feet, Table 17. Since the average construction cost for a new deck was $6,161, the average construction cost for a deck in the US was $13.51 per square foot, although this increased to $15.63 per square foot on the west coast. Approximately 45% of the construction cost was attributed to the deck surface while another third was for the substructure and 21% was for accessories. Just over 40% of deck builder projects were new (first time) decks built on existing homes while 25% were new decks built on new homes and almost a third were replacement decks built on existing homes.

The survey data clearly shows substantial differences in deck characteristics based on geographic location, Table 18. For example, deck builders in the eastern US built more than twice as many decks per year as companies in the interior west and three times as many as companies on the west coast. In addition, the average deck size was significantly higher in the west, although the average construction cost in the interior west was substantially lower than in either the eastern US or the west coast. As a result, there was significant variation in the unit construction cost for decks in each region. Unit construction costs in the eastern US were $14.81 per square foot versus $8.18 in the interior west and $15.63 on the west coast. Finally, deck builders on the west coast primarily target new deck construction on both new and existing home with relatively little focus on deck repair/replacement. In contrast, deck builders in the east and interior west have a much more balanced mix of deck building projects.

Material Use Changes

One objective of this research was to assess how the use of decking materials has been changing over time. To evaluate this, respondents were asked to indicate how their use of eight specific decking materials has changed over the past two years, Table 19. In addition, respondents were given the option of indicating that they had never used a specific product. The vast majority of respondents indicated that they had never used Alaska yellow cedar (AYC). However, among deck builders, almost 15% indicated that they had used AYC and more than half of those who had used AYC reported that their use had either increased or remained the same over the past two years.

The aggregate survey data indicates that the use of western red cedar, redwood and treated lumber has declined substantially while wood-plastic composite lumber (WPC), tropical hardwoods and plastic lumber use are increasing. To help highlight the material use changes trends, we developed a simple rating scale called the Material Trend Scale (MTS). In the MTS, the percentage of decreased use for a product is subtracted from the percentage of increased use for that same product, resulting in a positive or negative MTS value. A large positive value would correspond to strong increases in material use (suggesting that builders are happy with the product) whereas a negative value would correspond to decreased use of a material (suggesting that builders are not happy with the product). For example, in considering WPC, the MTS value would be 55.1% (57.9%-2.8% = 55.1%). Of course, it is important to consider the percentage of respondents who indicated that their use of the material has remained unchanged as well as the percentage of respondents who indicated that they have never used the material. For the total sample, only three materials displayed large positive values: WPC-55.1%, plastic lumber-12.4% and tropical hardwood-6.5%, although it is useful to note that more than two-thirds of the respondents have never used tropical hardwoods or plastic lumber.

Table 19. Changing material use in deck building over the past two years.

Total Sample	Increased	Remained the Same	Decreased	Never Used
Alaska Yellow Cedar	0.8	3.1	4.8	91.2
Western Red Cedar	8.1	28.2	25.4	38.3
Redwood	4.6	20.3	22.0	53.1
Treated Lumber	22.1	50.8	20.4	6.7
Untreated Lumber	3.6	16.2	9.6	70.7
Wood-Plastic Composite	57.9	15.2	2.8	24.2
Tropical Hardwood	11.7	13.4	5.2	69.7
Plastic	15.7	7.1	3.3	74.0
Home Builders				
Alaska Yellow Cedar	0.0	1.4	3.3	93.4
Western Red Cedar	5.2	28.3	17.5	46.2
Redwood	3.8	22.2	16.0	55.7
Treated Lumber	23.1	59.4	9.0	7.1
Untreated Lumber	2.8	12.3	7.1	67.5
Wood-Plastic Composite	40.1	20.3	2.8	33.0
Tropical Hardwood	1.9	7.1	2.4	81.1
Plastic	6.6	3.8	0.5	80.7
Deck Builders				
Alaska Yellow Cedar	2.1	5.5	6.9	85.5
Western Red Cedar	11.8	27.0	35.5	25.7
Redwood	5.6	16.8	30.1	47.6
Treated Lumber	20.1	37.6	36.2	6.0
Untreated Lumber	4.2	19.4	11.8	64.6
Wood-Plastic Composite	79.6	7.2	2.6	10.5
Tropical Hardwood	24.5	21.1	8.8	45.6
Plastic	27.1	11.1	6.9	54.9

Home Builders

Among home builders, both treated lumber and wood-plastic composite lumber recorded large increases in usage. In contrast, western red cedar (WRC) and redwood (RW) use recorded large decline is use. More than two-thirds of home builders indicated that they had never used AYC, untreated lumber tropical hardwood or plastic lumber while almost half reported that they had never used WRC or RW. The data suggests that home builders have been reducing their use of naturally durable wood species in favor of treated lumber and WPC. While only 20% of home builders reported using plastic lumber, almost 95% of those who had used it reported that their use was either increasing or remaining the same. The only materials with large positive usage values were: WPC-37.3% and treated lumber-14.1%.

Deck Builders

While home builders appear to favor a limited number of decking products (primarily treated lumber and WPC), the survey data suggests that deck builders use a much broader mix of decking products. For example, the percentage of deck builders who reported never having used a decking material was substantially lower than the percentage of home builders for every material included in the survey. Deck builders have registered their largest increases in material use for WPC, plastic lumber and tropical hardwoods. Interestingly, while 20% of deck builders reported increasing their use of treated lumber, almost twice as many (6.2%) indicated that their use had declined. The data suggests that many deck builders are reducing their use of WRC, RW and treated lumber in favor of WPC, tropical hardwoods and plastic lumber. The deck materials with the largest positive usage values included: WPC-77%, tropical hardwoods-15.7% and plastic lumber-20.2%.

Table 20. Material use in different end-use applications in deck building in 2003.

Total Sample	Substructure	Surface	Accessories
Alaska Yellow Cedar	0.4	0.5	0.4
Western Red Cedar	2.3	12.2	17.4
Redwood	3.1	9.6	11.5
Treated Lumber	81.2	34.3	34.0
Untreated Lumber	5.9	0.8	2.3
Wood-Plastic Composite	4.5	32.7	21.6
Tropical Hardwood	0.3	3.2	2.4
Plastic	0.1	2.1	2.8
Other	2.2	4.3	7.2
Home Builders			
Alaska Yellow Cedar	0.7	0.2	0.1
Western Red Cedar	3.4	13.1	17.4
Redwood	5.3	12.5	14.3
Treated Lumber	74.3	38.4	37.5
Untreated Lumber	5.8	0.2	2.6
Wood-Plastic Composite	7.1	27.9	17.2
Tropical Hardwood	0.0	1.4	1.2
Plastic	0.2	0.6	1.6
Other	3.2	4.9	8.1
Deck Builders			
Alaska Yellow Cedar	0.0	0.9	0.9
Western Red Cedar	0.7	10.8	17.5
Redwood	0.0	5.3	6.6
Treated Lumber	91.2	28.3	27.8
Untreated Lumber	6.0	1.5	1.8
Wood-Plastic Composite	0.6	39.6	29.5
Tropical Hardwood	0.7	5.8	4.4
Plastic	0.0	4.2	4.8
Other	0.8	3.5	5.6

Material Use in Decking End-Use Applications

Determining the specific types and shares of materials used in deck construction was another objective of this research. The survey data shows that treated lumber is the dominant material used in deck substructures with an overall market share of 81.2%, Table 20. Treated lumber and WPC each represent about a third of the deck surface market while WRC and RW together comprise another 22%. Finally, treated lumber has a 34% share of the accessories market while WRC and RW represent another 30% followed by WPC with 22% of the overall market. The market share of AYC is extremely small (less than 1%) in all end-use applications. However, the survey data indicates that home builders almost exclusively used AYC for deck substructures while deck builders used AYC for both deck surfaces and accessories. While it is impossible to say for certain, it appears that when AYC is used for deck surfaces, it is also used for deck accessories, suggesting that deck builders like to use the same material for both end-uses.

Home Builders

Approximately three-quarters of the decks built by home builders use treated lumber for the substructure while the remaining market share is distributed fairly evenly between RW, untreated lumber and WPC. Home builders tend to use a higher proportion of WRC, RW and treated lumber than the overall average.

Deck Builders

Material use by deck builders for deck substructures was dominated by treated lumber with a market share of over 90%, Table 20. Material use in deck surface applications was dominated by wood-plastic composite products followed by treated lumber and western red cedar. Finally, approximately 30% of deck accessories were built using wood-plastic composites and treated lumber while an additional 18% were built from western red cedar.

The material usage data summarized in Table 20 highlight some important differences between home builders and deck builders. Interestingly, whereas deck builders almost exclusively use treated lumber for deck substructures, home builders are more likely to use naturally durable wood species as well as WPC lumber in this application. This is interesting given the fact that few WPC products are manufactured in cross-sectional sizes that would be appropriate for support beams or primary posts. This would suggest that home builders are most likely using WPC lumber as joists and perhaps intermediate support posts. Interestingly, deck builders, who we could assume are more knowledgeable of deck construction details and material specification, use virtually no WPC lumber in deck substructures. From this we can conclude that either home builders are ahead of the curve in terms of trying WPC as a structural material in deck substructures or else they are mistakenly specifying WPC for an application where its use is not intended. In either case, this finding merits additional investigation into how home builders are using WPC in structural applications.

The data also shows that deck builders use a substantially higher proportion of WPC for both deck surfaces and accessories than do home builders. In contrast, home builders tend to specify treated lumber, western red cedar and redwood more often than deck builders. Deck builders also appear to be more willing to try plastic decking products and tropical hardwood than are home builders. Finally, while neither group uses Alaska yellow cedar to any great extent, home builders seem to favor its use in deck substructures whereas deck builders use it for deck surfaces and accessories.

Attribute Importance in Material Specification

Survey respondents were asked to rate the importance of a variety of material attributes on their specification of decking materials using a Likert-like scale where an importance rating of 1 meant that the material attribute was not important at all, an importance rating of 4 meant that the attribute was somewhat important and an importance rating of 7 meant that the attribute was very important. Knowing the importance rating between different material attributes is useful in understanding the relationship between different material attributes and can also be useful in helping which material attributes might be most effective in differentiating a product from competing products. The average importance ratings across all survey respondents are summarized in Table 21. Importance ratings for home builders and deck builders are also provided in Table C3 in the Appendices while a comparison of importance ratings based on the geographic location of the respondent are summarized in Table C4.

Table 21. Average importance ratings of material attributes for decking material.

Material Attribute	Total Sample
Long Life	6.28
Consistent Material Quality	6.23
Beautiful & Aesthetically Pleasing	6.14
Availability	6.07
Naturally Decay Resistant	5.87
Ease of Maintenance	5.69
Price Stability	5.67
High Workability/Ease of Use	5.41
High Strength Properties	5.27
Resistance to Splintering	5.16
Low Material Cost	5.09
Little Product Waste	5.06
Low Heat Retention in Service	4.01

Note: Attribute importance was rated using a Likert-like scale where an importance rating of 1 = not important, a rating of 4 = somewhat important and a rating of 7 = very important.

The summary data suggests that there are three groups of material attributes. The most important attributes, those with an importance rating higher than 6, included long life, material quality, beauty and availability. The second group of attributes (those with an importance rating between 5.5 and 6.0) included natural decay resistance, ease of maintenance and price stability. It is interesting to note that while price stability was rated moderately high, the actual price of a decking material was rated as being relatively unimportant, receiving the third lowest importance rating.

Home Builders vs Deck Builders

The summary of the importance rating data for deck builders and home builders is presented in Table C4. While the importance rating obtained from each group showed some significant differences, the relative ranking of material attributes was virtually the same between the groups. The biggest difference between the two groups was the fact that low material cost was given the lowest importance by deck builders while it was rated as being significantly more important by home builders. This suggests that deck builders base their material purchase decisions less on price and may be an indication that their customers are less price sensitive, preferring high quality, durability and ease of maintenance over low price.

Perceptions of Relative Material Attributes

Respondents were also asked to indicate the degree to which each decking material possessed a specific material attribute using a Likert-like scale where a rating of 1 meant that the material did not possess the attribute at all and a rating of 7 meant that the material possessed the attribute to a high degree. The average ratings across all survey respondents are summarized in Table 22. Individual ratings for home builders and deck builders are also provided in Table C5 in the Appendices while a comparison of ratings based on the geographic location of the respondent are summarized in Table C6.

The material attributes presented to survey respondents included five of the highest rated attributes in terms of their influence on the material specification process: long life, beauty, ease of maintenance, availability and natural decay resistance. Two of the material attributes, strength and low cost, were also included in this question. Overall, it is interesting to note that previous experience using AYC relates to much higher scores and better perceptions of AYC relative to other materials. This observation has important implications regarding the marketing of AYC.

In terms of long life, wood-plastic composite (WPC) lumber received the highest rating by far. Other highly rated materials included tropical hardwood lumber (THW), plastic lumber, treated lumber and redwood. Interestingly, AYC was ranked 7th out of eight materials with a ranking of just 4.46. This suggests that many home and deck

builders are not familiar with the superior durability of AYC. In terms of beauty, the highest rated product was redwood lumber with a rating of 6.02. Other highly rated materials included THW and western red cedar (WRC). Surprisingly, WPC lumber with a rating of 5.27 was perceived to be more beautiful than AYC which received a rating of 5.05. However, further analysis of the data showed that when the respondent had used AYC, they rated it substantially higher than WPC (5.26 vs. 4.34) than if they had not used AYC (5.01 vs 5.45). This shows familiarity with AYC is an important factor in influencing builder's perceptions of the wood.

Table 22. Average ratings for each decking material with respect to the degree to which each material possesses each specific material attribute.

Long Life	**AYC**	**WRC**	**RW**	**PT**	**UT**	**WPC**	**THW**	**Plastic**
Non User	4.33	5.20	5.49	5.56	2.24	6.18	5.56	5.53
User	5.00	4.94	5.04	5.26	2.75	6.27	5.55	5.45
Total	4.46	5.17	5.44	5.53	2.30	6.19	5.55	5.52
Beauty								
Non User	5.01	5.86	6.11	4.09	2.94	5.45	5.89	4.48
User	5.26	5.77	5.97	3.68	3.61	4.34	5.82	3.48
Total	5.06	5.85	6.10	4.05	3.01	5.33	5.88	4.34
Ease of Maintenance								
Non User	3.98	4.50	4.72	4.63	2.36	6.28	4.89	5.69
User	4.52	4.50	4.70	4.10	2.48	5.89	4.96	5.86
Total	4.08	4.50	4.72	4.58	2.37	6.24	4.90	5.72
Availability								
Non User	2.58	5.30	4.92	6.59	6.30	6.39	4.74	5.37
User	3.10	5.34	4.16	6.28	5.73	6.20	4.44	4.88
Total	2.67	5.30	4.84	6.56	6.24	6.37	4.70	5.30
High Strength								
Non User	4.38	5.05	5.18	6.01	4.86	4.97	5.97	4.44
User	4.79	4.61	4.88	5.62	5.08	4.00	5.67	3.76
Total	4.45	5.00	5.15	5.97	4.88	4.87	5.93	4.35
Low Cost								
Non User	3.39	4.12	3.75	5.36	5.08	3.98	3.57	3.92
User	3.72	4.13	3.18	5.00	5.00	3.62	3.39	3.95
Total	3.45	4.12	3.69	5.32	5.07	3.94	3.55	3.93
Natural Decay Resistance								
Non User	4.74	5.19	5.44	5.66	1.86	6.45	5.63	6.36
User	5.03	4.97	5.24	5.22	2.52	6.17	5.42	6.18
Total	4.79	5.17	5.42	5.62	1.93	6.42	5.60	6.34

This question refers to builder's relative perceptions of specific deck materials. Respondents were asked to indicate the degree to which each material possesses each attribute using a Likert-like scale where a rating of 1 means the material does not possess the specific attribute at all and a rating of 7 means that the material possesses the attribute to a high degree.

Both WPC and plastic lumber were widely perceived has being the easiest materials to maintain. Further behind were the naturally durable species followed by pressure treated lumber (PT) and untreated lumber. AYC was the lowest rated material in terms of its availability, even lagging behind redwood and tropical hardwoods. This was true between both the users and non-users of AYC lumber. This perception of restricted availability was often cited by respondent s as a major factor in the low use rate for AYC.

Respondents indicated that the lowest cost materials were perceived to be treated and untreated lumber. In contrast, redwood was perceived to be the most expensive material followed by THW, WPC and AYC. However, there was little difference in the relative ratings for these four materials, suggesting that cost does not pose a major disadvantage for any of the naturally durable materials. Finally, the materials perceived to have the highest level of natural durability were WPC and plastic lumber. The naturally durable wood materials, while highly rated, were rated substantially lower both of the non-wood materials.

Perceptual Maps of Decking Materials

The survey data derived from the importance ratings and the perceptions of relative material attributes was used to develop a set of perceptual maps. Perceptual mapping is a graphical technique used to visually display consumer perceptions. Typically the position of a product is displayed relative to competing products along a pair of axes which represent a set of attributes. For example, Figure 27 shows a perceptual map for home builders perceptions of decking materials along the two dimensions of long life and beauty. The survey results indicate that home builders perceive WPC as having the longest life, as indicated by the fact that WPC is located farther to the right along the long life axis than any of the decking materials evaluated. Similarly, home builders perceived that RW was the most beautiful material, as indicated by the fact that RW is located higher on the graph along the beauty axis than any of the decking materials considered. Decking materials that are positioned close to each other are perceived by consumers as being similar along the two attributes being considered. For example, home builders perceived AYC and WRC as being fairly similar in terms of long life and beauty.

The perceptual maps also display ideal points for materials based on the pair of attributes being considered. The ideal point represents the respondent's perception of the best combination of the two attributes and any material located above and to the right of the ideal point (in the shaded region of the graph) would be perceived as possessing more than the ideal amount of each attribute. Since having too much of an attribute may lead to added material costs, a wise marketing strategy is to try to position a product as close to the ideal point as possible while still be perceived as surpassing competing products.

Home builder's perceptions of various decking materials along the attributes of long life (x-axis) and beauty (y-axis) are presented in Figure 27. In this figure it can be seen that WRC, RW, AYC and THW for a cluster in the upper right quadrant, suggesting two things. First, home builders perceive these products as being both beautiful and having long life. Second, the close clustering implies that home builder's perceive these products as being relatively similar along the two attributes, although RW is perceived as being the superior material in a relative sense. Third, all four materials are perceived as being above the ideal point in beauty although all are below the ideal point in terms of long life, implying that a marketing strategy for AYC should aim to reposition this material farther to the right by emphasizing the natural durability and long life of AYC lumber. Figure 27 also shows that home builders perceive that WPC, plastic lumber and treated lumber, while having long life, are not beautiful. Finally, untreated lumber is perceived as being neither beautiful nor having long life.

In contrast to home builders, deck builders perceive that AYC is lacking in long life and is substantially lower than the other naturally durable species in terms of beauty. While WRC, RW and THW are all perceived as being close to or above the ideal point in beauty, AYC is well below this point. The marketing challenge with deck builders is to improve their perception of AYC in terms of its longevity and beauty.

Figure 29 shows that all decking materials, with the exception of untreated lumber, are perceived by home builders as having long life and being naturally decay resistant. All of the decking materials are located below the ideal point for long life while both plastic lumber and WPC are located above the ideal point for natural decay resistance.

Deck builders perceive that AYC is lacking in long life and is just barely positive in terms of natural decay resistance, Figure 30. In contrast, THW, plastic lumber and treated are lumber are all well positioned in terms of

these two attributes. Both WPC and untreated lumber are perceived to be strongly lacking in both long life and natural decay resistance.

In considering the material attributes beauty and natural decay resistance, home builders again consider the naturally durable species (AYC, WRC, RW and THW) as a cluster, Figure 31. All are perceived to be above the ideal point in terms of beauty but below the ideal point in terms of natural decay resistance. WPC, plastic lumber and treated lumber are all perceived to have natural decay resistance but not beauty. Finally, untreated lumber is perceived to be both low in durability and low in beauty.

Finally, deck builders perception of the various decking materials are represented in Figure 32. While RW, WRC and THW are all located in close proximity to the ideal point, AYC has a lower (although positive) beauty rating and a low, positive rating for natural decay resistance. Both plastic lumber and treated lumber have very low beauty ratings but are rated above the ideal point in terms of natural decay resistance. WPC is rated extremely low in terms of natural decay resistance although its beauty rating is similar to that of AYC.

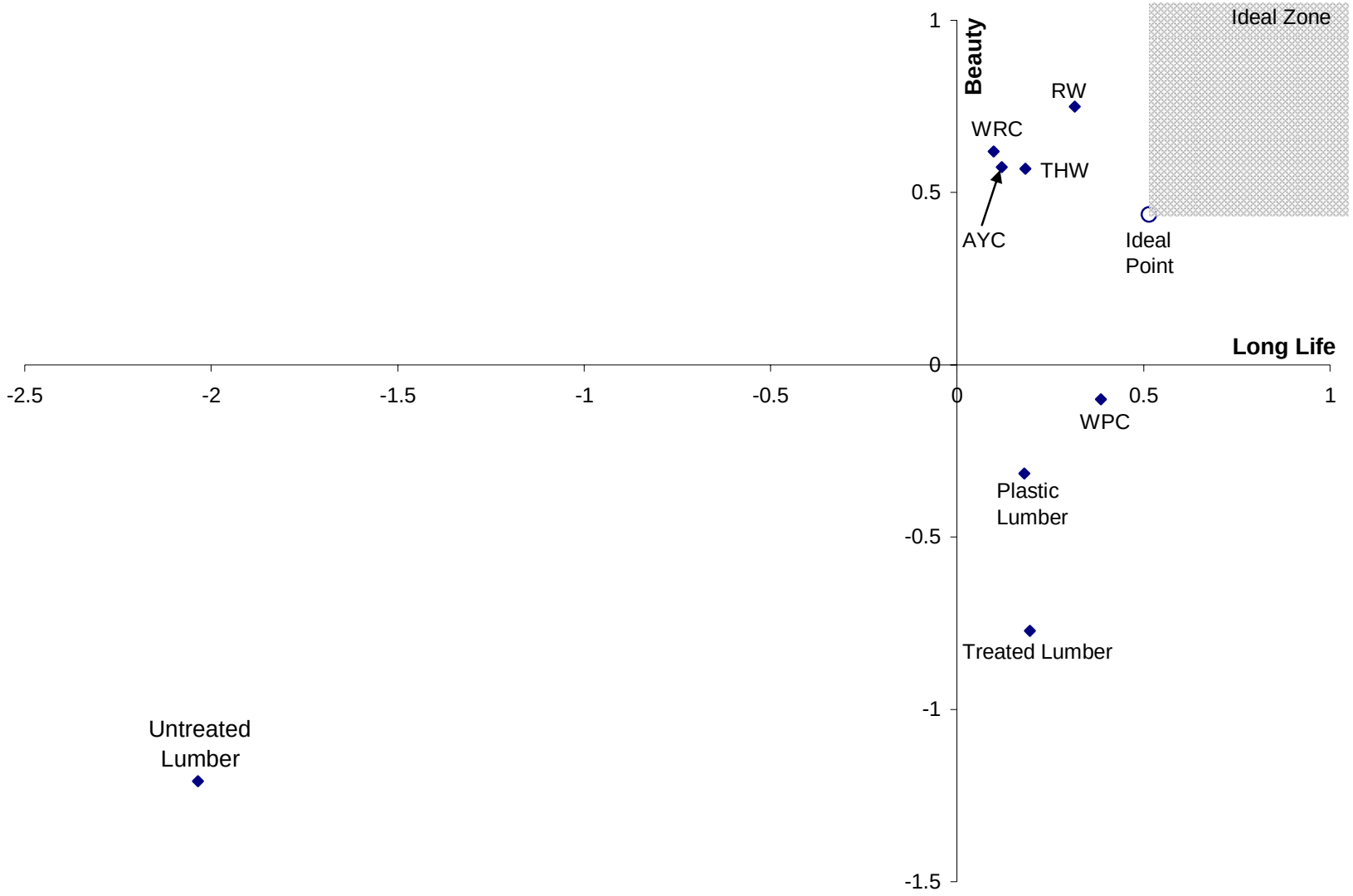

Figure 27. Home builder's perceptions of the degree to which decking materials possess the material attributes: beauty vs long life.

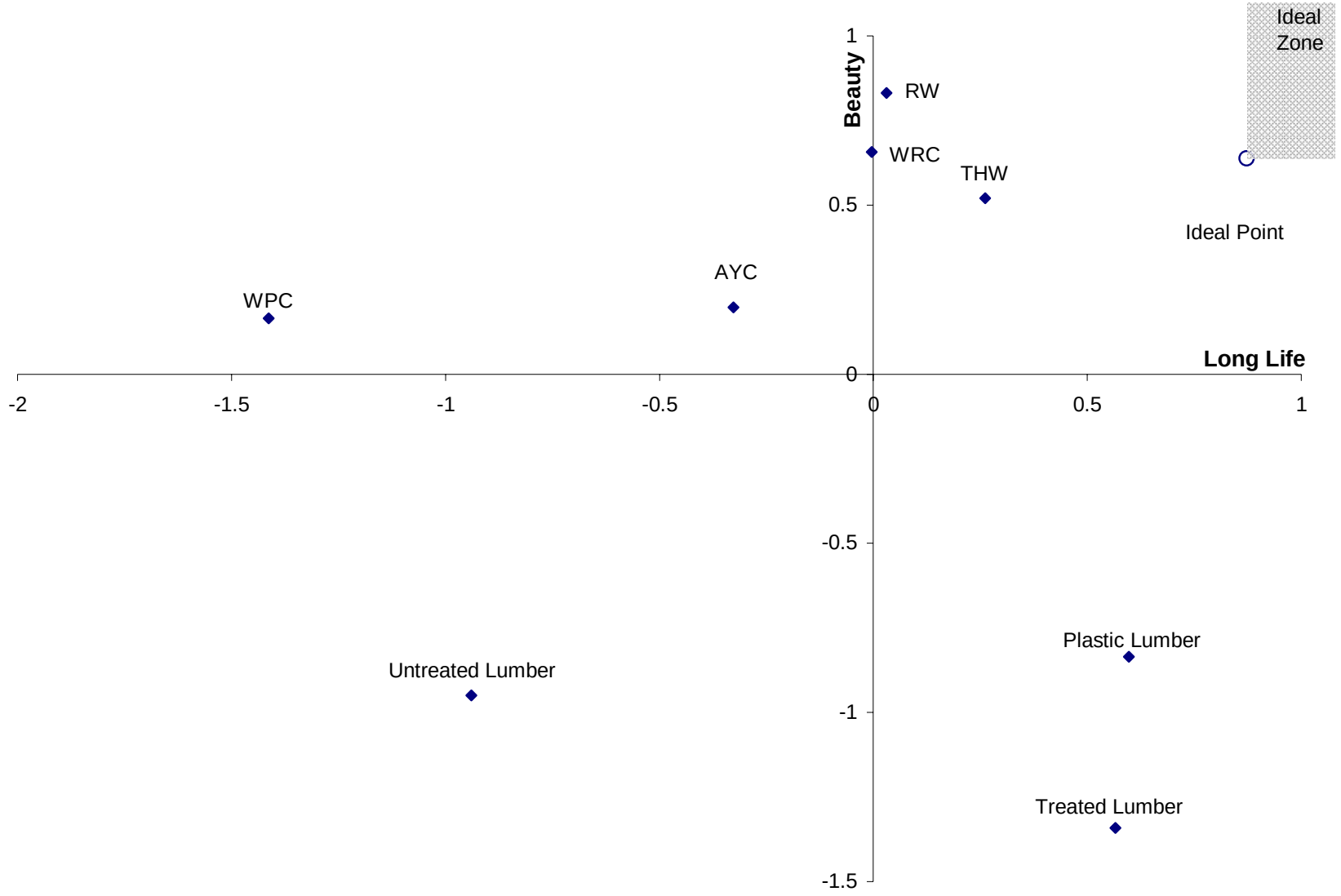

Figure 28. Deck builder's perceptions of the degree to which decking materials possess the material attributes: beauty vs long life.

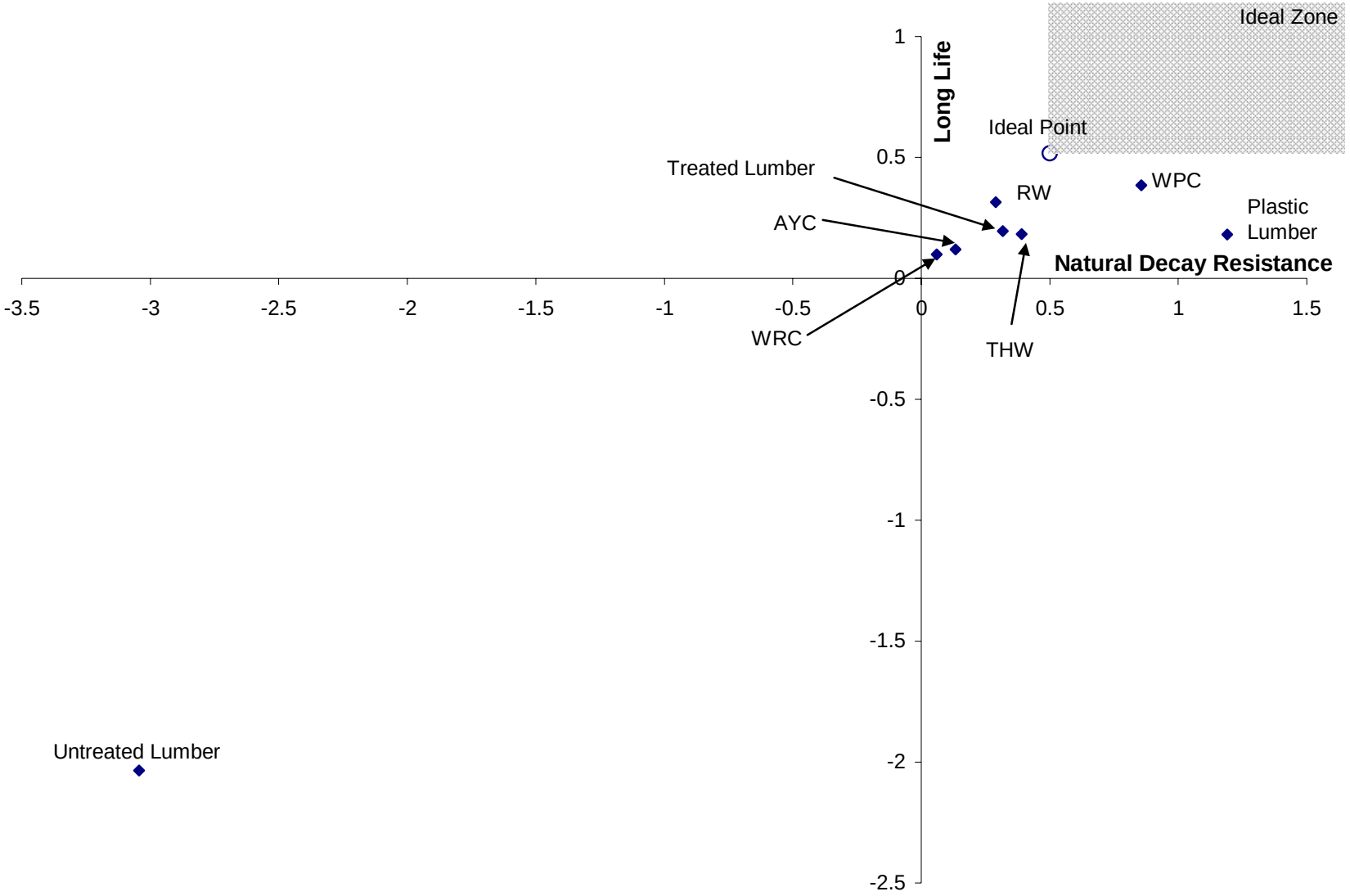

Figure 29. Home builder's perceptions of the degree to which decking materials possess the material attributes: natural decay resistance vs long life.

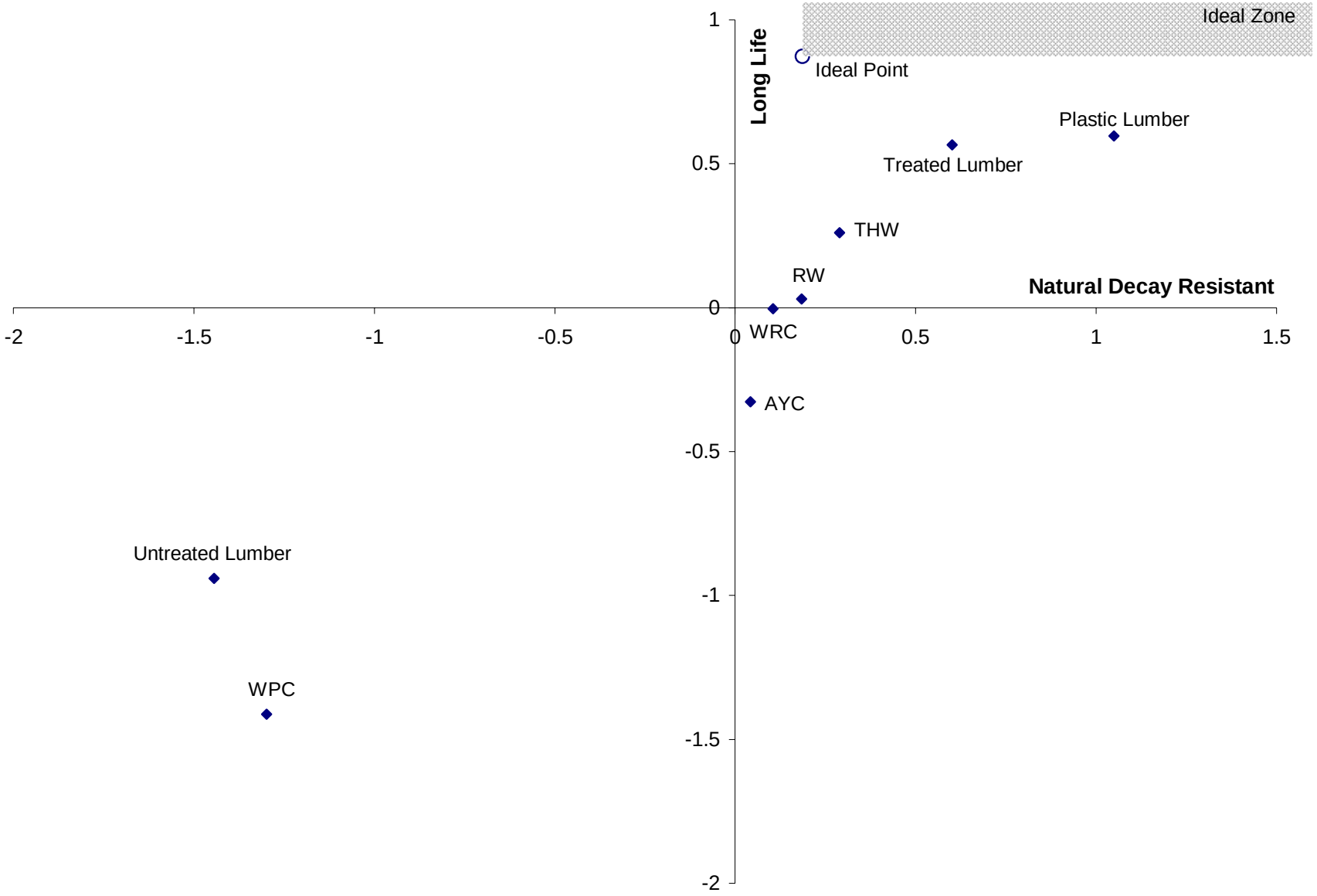

Figure 30. Deck builder's perceptions of the degree to which decking materials possess the material attributes: natural decay resistance vs long life.

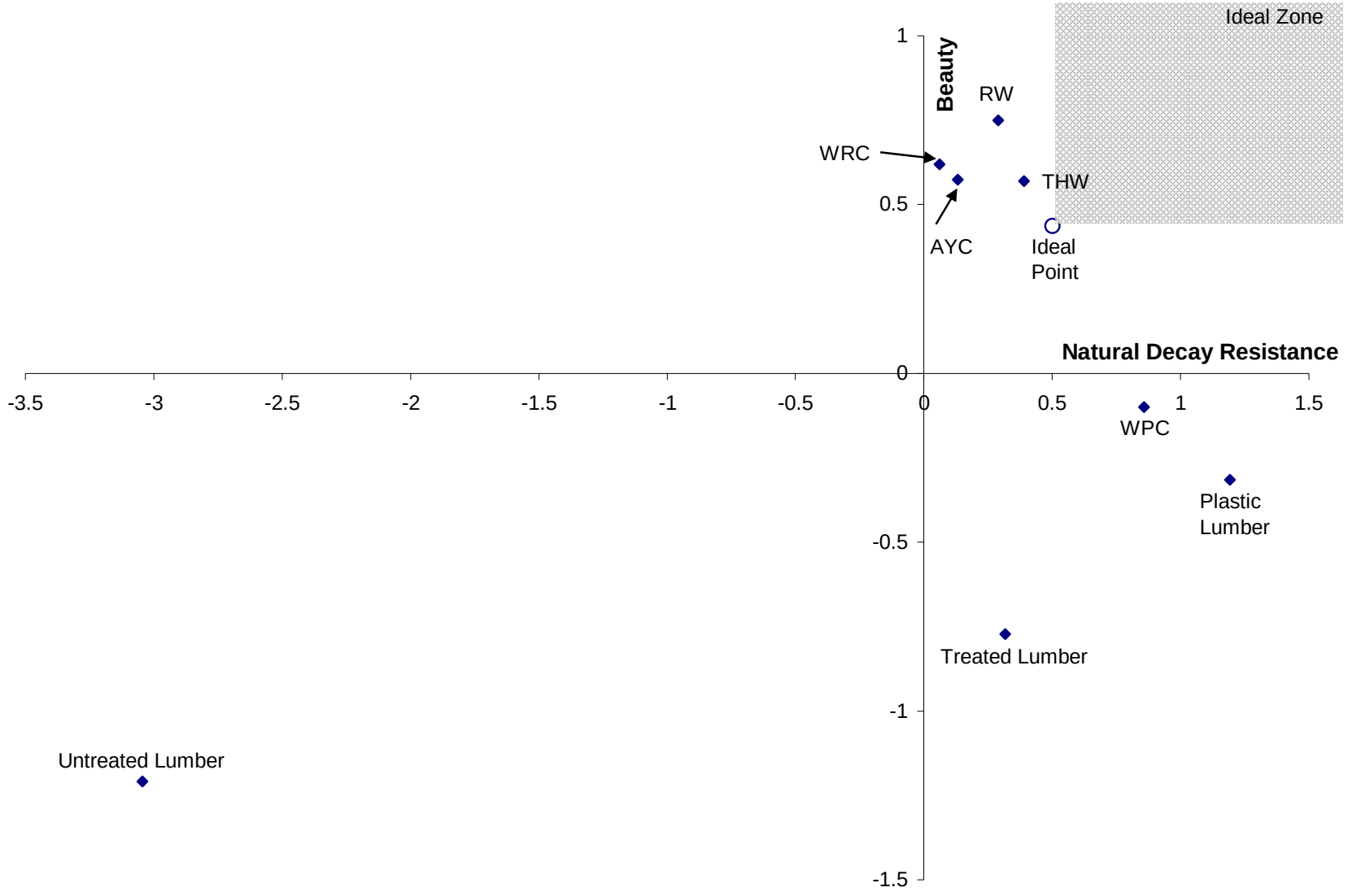

Figure 31. Home builder' perceptions of the degree to which decking materials possess the material attributes: beauty vs natural decay resistance.

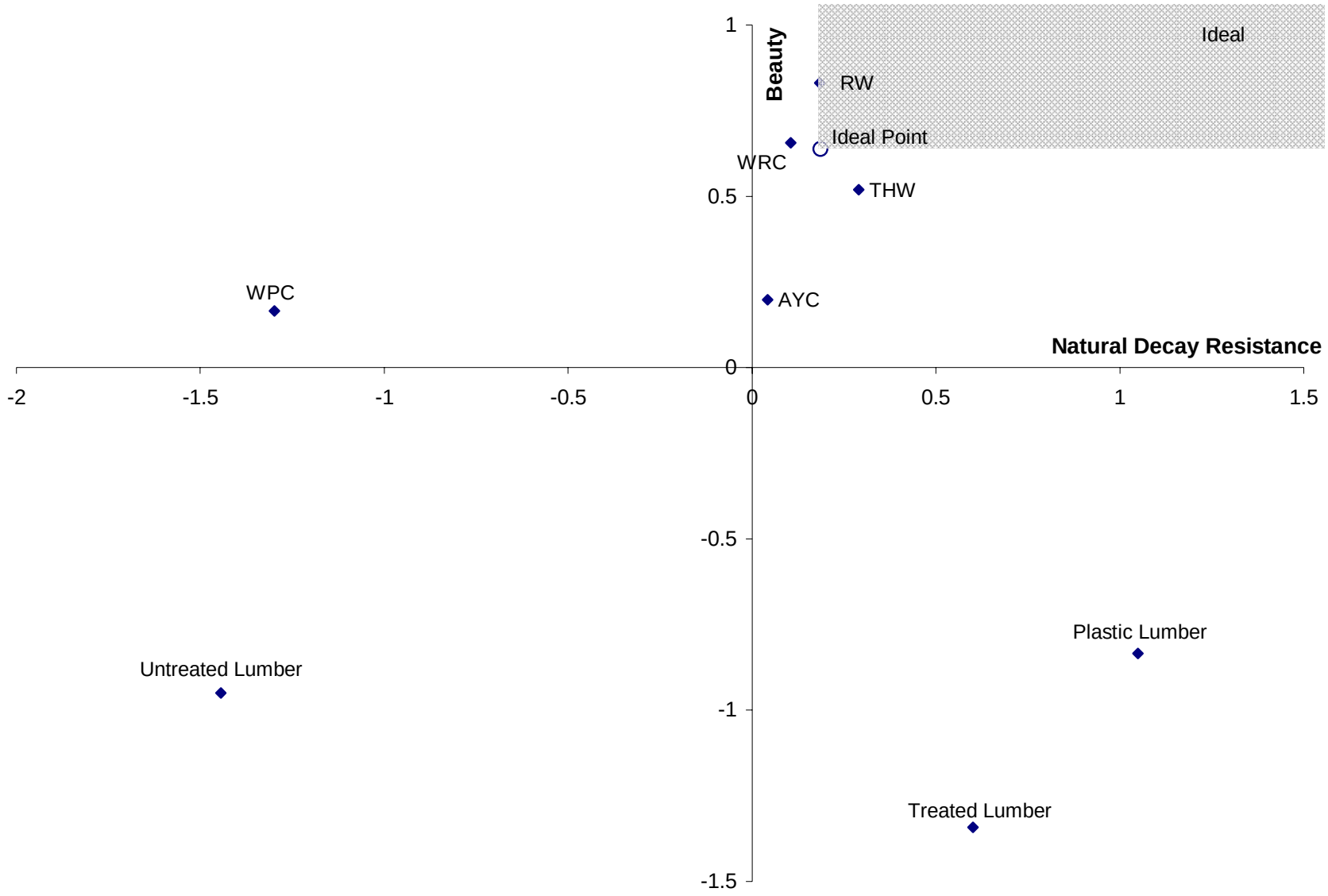

Figure 32. Deck builders perceptions of the degree to which decking materials possess the material attributes: beauty vs natural decay resistance.

Cluster Analysis

Cluster analysis is a data analysis method for classifying observations into two or more previously unknowns groups. The objective is to sort cases (i.e., respondents) into groups (or clusters) so that the degree of association is strong between members of the same cluster and weak between members of different clusters. Cluster analysis can be used to uncover associations and structure in data which may not have been evident prior to the analysis but which nevertheless is sensible and useful once found. A cluster analysis was performed on the entire set of respondent data (home builders and deck builders).

The results of the cluster analysis suggest that respondents can be classified into two Survey respondents grouped into the first cluster have a high wood usage index for all the decking materials (including AYC) except pressure treated lumber. In contrast, the second group reports a significantly higher usage of pressure treated lumber. The usage of all other decking materials is significantly lower in the second group relative to the first group. Hence we might label one group as the Pressure Treated Lumber group (PT), whereas the second group could be labeled as the Non-Pressure Treated Lumber group (Non-PT).

A statistical analysis of the survey data was conducted to try to characterize the differences between the two groups. The results of this analysis show that several of the importance ratings for the material attributes differed significantly between the two groups. The Non-PT group provided significantly higher importance ratings for the material attributes: longevity, beauty, ease of maintenance and resistance to splintering relative to the PT group. The PT group provided significantly higher importance ratings for low material cost, availability and price stability. This difference in importance ratings suggests that the Non-PT group is more interested in the aesthetic and superior material qualities of decking materials and that they are prepared to pay a premium to obtain decking materials with these attributes. In contrast, the PT group is much more concerned with low cost, ready availability and price stability.

A statistical analysis of the demographic data showed that the Non-PT group had a significantly higher proportion of its members located in the western US (particularly on the west coast). In contrast, a significantly higher percentage of the PT group were located in the eastern US. Finally, while a substantially higher proportion of the Non-PT group were deck builders, the difference between the two groups was not statistically significant.

Sources of Information

The survey data shows that the primary sources for information on decking materials for both home builders and deck builders are retail lumber yards and industry magazines, Table 23. However, deck builders were also much more likely to turn to the internet, trade shows and word-of-mouth for information on decking materials than are home builders.

Table 23. Sources of information for decking materials, deck builders vs. home builders.

Home Builders	Primary Source	Overall Total
Industry Magazines	32	98
Trade Shows	13	39
Word of Mouth	10	43
Internet	16	28
Retail Lumber Yards	79	100
Home Center	1	3
Contractor	4	7
Builders	5	6
Experience	15	18
Other	28	42
Deck Builders	**Primary Source**	**Overall Total**
Industry Magazines	43	140
Trade Shows	9	82
Word of Mouth	5	73
Internet	10	85
Lumber Yards	63	135
Other	9	21

Total number of respondents for deck builders and home builders was 156 and 212, respectively. Respondents could select multiple sources.

Survey respondents were also asked to identify who took the lead in specifying the type of decking material for a decking project, Table 24. Home builders indicated that the two main material specifiers were the home builder (43%) and the home owner (32%). This proportion was almost exactly opposite for the deck builders with the home owner specifying the type of decking material to be used 49% of the time and the deck builder specifying the material in 33% of the cases. In addition, the home builder reported that that deck builder specified the decking material used for new homes in 15% of the cases.

Table 24. Material specifier for deck projects, deck builders vs. home builders.

Material Specifier	Total	Home Builder	Deck Builder
Specified by Home Owner	39.30	***32.39****	***48.81***
Specified by Deck Builder	22.31	***14.58****	***32.96***
Specified by Home Builder	28.05	***42.89****	***7.62***
Specified by Deck Designer	7.46	6.98	8.14
Specified by Other	3.11	3.15	3.05

Table 25. Use of Alaska Yellow Cedar, deck builders vs. home builders.

Home Builders	**Total**	**East**	**Interior West**	**West Coast**
Have used	11	2.1%	1.7%	16.3%
Have never used	193	97.9%	98.3%	83.7%
Deck Builders	**Total**	**East**	**Interior West**	**West Coast**
Have used	21	12.9%	4.0%	25.7%
Have never used	124	87.1%	96.0%	74.3%

Finally, the data was analyzed to determine if there was any geographic pattern to the use of AYC lumber in decking applications, Table 25. While the number of respondent who reported using AYC was relatively small, the data suggests that a higher proportion of those respondents who reported using AYC were located on the west coast. This was true for both the home builder segment as well as the deck builder segment.

STRATEGIC MARKETING RECOMMENDATIONS

There is little doubt that Alaska yellow cedar wood is exceptionally well suited for outdoor applications in the decking market. However, the combination of a constrained supply, distance from market and customers lack of familiarity with the species pose substantial marketing challenges for Alaska's forest products industry. These challenges argue for the development of a marketing strategy that effectively responds to the competitive environment within the decking market while taking into account the realities of a constrained supply. This final section will present a marketing strategy for Alaska yellow cedar that is based on the results of the market research but which also takes into account the unique challenges confronting the Alaska forest products industry.

Our market research clearly indicates that there is a promising opportunity to introduce Alaska yellow cedar into the US decking market. This optimistic outlook is based on several trends: the US decking market is expected to grow by 11.6% in volume terms and 41% in value terms between 2003 and 2008, lifestyle trends have been changing to emphasize the outdoors as an extension of the home (especially for entertaining), this interest in outdoor entertaining has contributed to an increase in the size and price of decks being built, concern about the toxicity of the chemical preservatives used in treated lumber has increased the demand for naturally durable decking materials, and constrained supplies of redwood and some tropical hardwoods could provide an opportunity for Alaska yellow cedar to expand it position in the marketplace.

However, while an opportunity to expand the use of Alaska yellow cedar in the US decking market exists, the ability to capitalize on this market opportunity requires the development and implementation of an effective marketing strategy. The remainder of this section will discuss the components of a strategic marketing plan based on the results of the surveys of the US deck building industry. The strategic plan will begin with a description of the target market and continue with a discussion of the four primary components of the marketing strategy: product, distribution, promotion and price.

Target Market

The development of a market for Alaska yellow cedar must take into account the fact that the resource supply is constrained. However, the high quality of yellow cedar lumber grown in Alaska, including good dimensional stability, natural durability, narrow growth rings and attractive color suggests that this product should be positioned in the market as a premium product targeted to a market segment that is less price sensitive and more willing to pay a price premium for a high quality product. The results of our market research suggest that the target market for Alaska yellow cedar should be deck builders located on the US west coast, comprised of California, Oregon and Washington. The survey results show that decks built in this market are larger, more expensive and more likely to use naturally durable woods. The focus on deck builders is based on the fact that the demand for decking lumber in the repair and remodel market is expected to total 4.4 billion board feet in 2005 as compared to a demand of just 700 million board feet in the new construction market. In addition, our research results indicate that approximately 46% of the decks built on new homes are subcontracted out to deck builders. Additionally, it is estimated that while homeowners install a substantial percentage of the decks built each year, almost 80% are installed by professionals. Further refinement of the size and location of the target market (e.g., narrowing the marketing focus to a set of major metropolitan areas, for example) should be considered once a realistic supply projection for Alaska yellow cedar logs has been concluded.

Having said this, it is important to note that the survey results suggest that homeowners play a very important role in specifying the decking material. For example, in this research home builders indicated that the home owner was responsible for specifying the decking material 30% of the time while deck contractors indicated that the homeowners specified the decking materials almost 50% of the time. Hence the home owner clearly plays a key role in the material specification process. While homeowners were not surveyed in this research, there is enough evidence to suggest that it would be useful to consider both deck builders and homeowners in the development of the marketing strategy.

Product

The product offering should reflect a premium product strategy. Based on the survey results we recommend that lumber manufacturers in Alaska supply a family of products that includes decking lumber, deck joists and accessory products. This recommendation is based on the survey results showing that the use of naturally decay resistant wood is substantially higher in deck surface and deck accessory applications as opposed to deck substructures (although lower grades of AYC lumber could be used to produce 2x6 and 2x8 deck joists). The survey data further suggests that deck builders tend to favor the use of a single species for both deck surfaces and deck accessories. While there is a broad range of accessories that are produced for decks, we recommend that Alaska producers consider focusing on offering a basic line of deck railing components. Given the current level of lumber manufacturing technology in Alaska it makes sense to initially focus on producing Alaska yellow cedar lumber in the following sizes 2"x4" (for deck surfaces), 1"x6" (for deck trim), 2"x6" (for deck joists) and 2"x2" (for deck rails). However, in the future positioning AYC as a premium decking material would support a strategy of offering a 5/4" radius edged decking product, perhaps with a grooved surface.

Distribution

Developing an efficient distribution channel for AYC decking products will be critical to the market development strategy. Our market research clearly shows that many deck builders cited the lack of availability as a primary reason why they have not been willing to use AYC or why they have not increased their use of AYC. Consequently, it will be important to match the expected supply of products with the size of the target market. Uncertainty over the short-term supply would argue for a more conservative strategy that constrains the size of the target market during the initial phase of the marketing campaign, allowing it to increase only as an increased supply of AYC products become available. Further, given the distance of Alaska suppliers from the target market, we would recommend that Alaska lumber producers consider establishing a relationship with stocking wholesalers that would allow for substantial volumes of product to be inventoried within a target market to reduce the logistical constraints of providing a reliable supply of products within a short timeframe.

Pricing

From the survey it was observed that deck builders using naturally durable lumber products provided the lowest importance rating for material cost, although price stability was rated somewhat higher. This result suggests that deck builders using naturally durable wood species have a relatively low price sensitivity which supports our recommendation for implementing a premium pricing strategy. In contrast, deck builders placed the highest importance on lumber attributes such as durability, beauty, consistent material quality and reliability of supply. Emphasizing these lumber attributes will further support the premium pricing strategy. We recommend pricing AYC slightly lower than similar WRC and redwood products initially.

As mentioned earlier, the pricing policy should support the strategy of positioning AYC as a premium, high quality product. Given the similar characteristics between AYC and WRC and RW, it makes sense to position AYC as a direct competitor to these other high quality, naturally durable species. However, the perceptual maps presented in Figures 28, 30 and 32 summarize the marketing challenges of positioning AYC in this way. For example, these figures indicate that deck builders rated AYC lower in terms of beauty, long life and natural decay resistance relative to both WRC and RW. As a result, we recommend pricing AYC slightly below both WRC and redwood. This pricing strategy is based on two considerations. First, it reflects deck builders current perceptions of AYC and second, it provides a financial incentive for deck builders interested in using a naturally durable wood a financial incentive to try AYC or increase their current use of AYC.

While a premium pricing strategy can go part of the way towards communicating high quality to customers, a clear promotional message will also be critical in supporting the pricing strategy and repositioning AYC in the mind of deck builders This may not be as hard as it sounds because the survey data showed that deck builders who had used AYC also provided AYC a substantially higher rating in terms of beauty, long life and natural decay resistance than did those deck builders who had not used AYC. This suggests that increasing deck builder familiarity with the properties and characteristics of AYC should help to reposition it as a competitor with WRC and RW.

Promotion

As mentioned in the pricing section, the promotional message must support the effort of positioning AYC as a high quality decking material. This means that the promotional message should emphasize the beauty, natural decay resistance, durability and consistent material quality of AYC. This can be effectively done by a direct comparison of AYC, WRC and RW across the major product attributes. As part of this strategy it may be useful to distinguish AYC from WRC and RW in terms of color, contrasting its light color to the darker colors of WRC and RW. This strategy will appeal to deck builders and home owners who are looking for a decking material that has beauty, durability and natural decay resistance but which provides a unique light colored appearance.

Additionally, the promotional strategy must address the fact that many deck builders (and presumably home owners) are unfamiliar with the properties and appearance of AYC. This can be accomplished through a variety of strategies, including working with stocking wholesalers to build sample decks in their show rooms and establishing a website to educate potential users on the properties, end-uses and benefits of using AYC. The website can be a very powerful toll for promoting AYC as a decking material. To illustrate the broad array of species and product information and product designs that can be communicated to potential end-users, we recommend reviewing the following websites:

- Western Red Cedar Lumber Association (http://www.wrcla.org)
- California Redwood Association (http://www.calredwood.org)

The survey data further indicated that deck builders utilized a broad range of information sources to learn about new decking materials. As a result, we recommend that AYC producers consider a low-cost strategy to provide information on AYC across a broad range of media including the internet (through use of a website on AYC), attendance at trade shows (for example, the annual Deck Expo conference), material spec sheets for distribution through retail lumber yards, advertising in industry magazines (for example, Professional Deck Builder) and advertising in consumer lifestyle magazines that emphasize the outdoor living (for example, the western focused Sunset magazine). Finally, it may be useful to consider the possibility of offering promotional incentives for stocking wholesalers who install sample AYC decking exhibits in their sales showroom area and who meet specified sales goals. For example, stocking wholesalers who meet these criteria might be flown to Alaska for a four day weekend of fishing and sightseeing. This type of promotional incentive could encourage stocking wholesalers to actively promote AYC to their customers interested in using a naturally durable wood.

The coordinated marketing strategy presented here can be effective in positioning AYC as a high quality decking material that will compete favorably with WRC and RW. However, the key to this strategy is to ensure that a reliable supply of high quality decking materials is available in the target market. Nothing would be more harmful in undermining the marketing effort than to develop a consumer's interest in using AYC lumber products only to find that there is not a reliable supply of the product available in the market. In this sense, developing and implementing the marketing strategy is the easy part. A summary of the marketing strategy is presented in Table 26.

Table 26. Summary of the recommended marketing strategy for AYC decking materials.

Marketing Variable	Strategic Marketing Recommendation
Target Market	Deck Builders (with consideration of home owners)
Geographic Location	US West Coast (CA, OR, WA)
Product	2"x4" (for deck surfaces), 1"x6" (for deck trim), 2"x6" (for deck joists) and 2"x2" (for deck rails)
Distribution	Stocking wholesalers in target markets to maintain adequate product inventory
Price	Premium price slightly below western red cedar and redwood
Promotion	Locate deck samples in sales showrooms, provide promotional incentives for stocking wholesalers
Promotion message	Establish premium product image by emphasizing beauty, durability, natural decay resistance and consistent material quality
Promotion outlets	Industry magazines, trade shows, retail lumber yards and internet web page

LITERATURE CITED

Anonymous. 2002. US Plastic & Wood-Plastic Composite Materials Demand to Expand Nearly 13% Annually Through the Year 2006. *Professional Deck Builder Magazine* 1(3):45, 63.

————————. 2003. DeckExpo 2003: State of the Industry Address and Forecast. *Professional Deck Builder Magazine* 2(3):54-55.

D.G. Bell & Associates. 1986. *Outlook for the Treated Lumber Market.* Toronto, Canada: Canadian Forestry Service and the Alberta Forest Service. 13 pp.

Dost, William A. 1982. Quality of Treated Lumber in California Retail Yards. *Proceedings of the American Wood-Preservers' Association*, 78, 155-162.

————————. 1988. Performance of Different Qualities of durable Lumber in Exposure as Wood Decking in California - A Progress Report. *Proceedings of the American Wood-Preservers' Association*, 84, 70-71.

Eastin, I.L., I. Ganguly and J. Roos. 2005. Material Use and Contractor Preferences. Professional Deck Builder. July/August. pp:66-68.

Economist, 2003. Irrational Exuberance Revisited. July, 19th (pages 57-58).

Freedonia Group. 2002. *Wood & Competitive Decking, Industry Study 1511*. Cleveland, Ohio, 247 p.

George Carter & Affiliates. 1989a. *A Market Research Project on Western Red Cedar, Volume I - Research Findings.* Prepared for Fletcher Challenge Canada. Oradell, New Jersey: George Carter & Affiliates. 98 pp.

———————— . 1989b. *A Market Research Project on Western Red Cedar, Volume II - Reference Appendix*. Prepared for Fletcher Challenge Canada. Oradell, New Jersey: George Carter & Affiliates. 37 pp.

Home Improvement Research Institute. 1993. *The Home Improvement Market, 1993/1994 Reference Guide*. Lincolnshire, Illinois: Home Improvement Research Institute. 175 pp.

R.E. Taylor & Associates. 2002. Wood Markets: The Solid Wood Products Outlook – 2002 to 2006. Vancouver, British Columbia, Canada: R.E. Taylor & Associates, Ltd. 601 p.

Random Lengths. Lumber Price Guide. Various editions.

Shook, Steven R. and Ivan L. Eastin. 2001. A Characterization of the US Residential Deck Material Market. *Forest Products Journal* 51(4):28-36.

Sinclair, Steven A. and Paul M. Smith. 1990. Product Awareness & Physical Risk Perceptions of Consumers of Treated Lumber. *Wood and Fiber Science*, 22(1): 80-91.

Smith, Paul M. and Steven A. Sinclair. 1989. The Do-It-Yourself Customer for CCA-treated Lumber Products. *Forest Products Journal*, 39(7/8): 35-41.

———————— and ————————. 1990. The Professional Contractor/Remodeler: Market Research for CCA-treated Lumber Products. *Forest Products Journal*, 40(6): 8-14.

Western Wood Products Association. Statistical Yearbook of the Western Lumber Industry. Various years.

APPENDIX A

Magazine Survey for Deck Builders

CINTRAFOR Survey on Material Use in the US Deck Building Industry

1) Referring to the materials listed below, please indicate whether your company's use of each material for building decks has *Increased*, *Remained the Same*, or *Decreased* over the past two years.

Deck Material	Over Past Two Years, My Company's Use of Deck Material Has….. Increased	Remained the Same	Decreased	My Company Has Never Used This Product
Alaska Yellow Cedar	❑	❑	❑	❑
Western Red Cedar	❑	❑	❑	❑
Redwood	❑	❑	❑	❑
Preservative Treated Lumber	❑	❑	❑	❑
Untreated Lumber (excluding cedar/redwood)	❑	❑	❑	❑
Wood & Plastic Composite Lumber	❑	❑	❑	❑
Tropical Hardwoods	❑	❑	❑	❑
Plastic Lumber	❑	❑	❑	❑
Other: _____	❑	❑	❑	❑

2) For each of the end-use applications listed, please indicate the percentage of decks that you built in 2003 using the following materials.

Deck Structural Material	Deck Substructure	Deck Surface	Deck Accessories
Alaska Yellow Cedar	____%	____%	____%
Western Red Cedar	____%	____%	____%
Redwood	____%	____%	____%
Preservative Treated Lumber	____%	____%	____%
Untreated Lumber (excluding cedar/redwood)	____%	____%	____%
Wood & Plastic Composite Lumber	____%	____%	____%
Tropical Hardwoods	____%	____%	____%
Plastic Lumber	____%	____%	____%
Other _____	____%	____%	____%
	100%	100%	100%

3) How important do you consider the following material attributes to be when selecting a material to build a deck?

Material Attributes	NOT IMPORTANT			NEUTRAL			EXTREMELY IMPORTANT
Long Life	1	2	3	4	5	6	7
Beautiful & Aesthetically Pleasing	1	2	3	4	5	6	7
Low Material Cost	1	2	3	4	5	6	7
Ease of Maintenance	1	2	3	4	5	6	7
High Workability/Ease of Use	1	2	3	4	5	6	7
Consistent Material Quality	1	2	3	4	5	6	7
Availability	1	2	3	4	5	6	7
Price Stability	1	2	3	4	5	6	7
High Strength Properties	1	2	3	4	5	6	7
Little Product Waste	1	2	3	4	5	6	7
Naturally Decay Resistant	1	2	3	4	5	6	7
Low Heat Retention in Service	1	2	3	4	5	6	7
Resistance to Splintering	1	2	3	4	5	6	7

4) This question refers to your relative perceptions of the following deck materials. For the materials listed below, please indicate the degree to which each material possesses each attribute. (Please provide your perception even if you have not used a specific material).

Deck Material Attribute	**Not At All**						To a **High Degree**
➢ **Long Life**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ **Beautiful & Aesthetically Pleasing**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ **Ease of Maintenance**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ **Availability**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ **High Strength Properties**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ **Low Material Cost**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ **Natural Decay Resistance**							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7

5) Where do you obtain information about decking products? (please check all that apply):

❑ Industry Publications ❑ Word of Mouth ❑ Lumber Supplier

❑ Internet ❑ Trade Shows ❑ Other: _____

6) Of the above sources, which do you consider to be your primary source of information? _____

7) Who usually specifies the material for the decks your company builds?

Home Owner	_____ %
Deck Builder	_____ %
Home Builder	_____ %
Deck Designer	_____ %
Other:	_____ %
	100%

Finally, we would like some information about you and your company for statistical purposes.

★ ALL SURVEY INFORMATION IS KEPT STRICTLY CONFIDENTIAL ★

8) What was the average size (in square feet) and the number of decks that your company built in 2003?

a) Average size of deck built: _____ square feet b) Number of decks built: _____

9) Please estimate the average construction cost *to your company* of the decks you built in 2003 and the cost distribution among the primary deck components?

Average construction cost: $_____

Deck Structure:	_____%
Deck Surface:	_____%
Deck Accessories:	_____%
Total	**100** %

10) Have you considered using Alaska yellow cedar lumber to build a deck? ❑ YES ❑ NO

a) If NO, why? _____
_____

11) Which of the following best describes the type of work your company does? (Please select only ONE).

❑ Deck Builder ❑ Deck Designer
❑ Wholesale Company ❑ Retail Company
❑ Manufacturer ❑ Home Builder/Contractor
❑ Other (please specify): _____

12) Approximately what was your firm's total sales revenue in 2003? *(Please check only one)*

❑ 0 - $100,000 ❑ $1,000,001 to $2,000,000
❑ $100,001 to $250,000 ❑ $2,000,001 to $3,000,000
❑ $250,001 to $500,000 ❑ $3,000,001 to $5,000,000
❑ $500,001 to $1,000,000 ❑ Over $5,000,000

13) For the decks you built in 2003, what percentage were built for the following reasons:

New deck for an existing home	_____%
Deck repair/replacement on an existing home	_____%
New deck for a new home	_____%
	100%

14) In what state does your company conduct the majority of its business? _____

15) Approximately how many years has your company been building decks? _____ years

Thank You Very Much for participating in this survey.

APPENDIX B

Telephone Survey for Home Builders

UW Survey on Material Use in the US Home Building Industry

Hello, I'm _____of The Field Company, a market research firm in Seattle. We're conducting a survey on behalf of the University of Washington on product usage of the different types of wood products used to build decks. The purpose of this survey is to learn how often and why certain types of wood are used by homebuilders for decks. All responses will be kept strictly confidential and the results will be used in aggregate form only. Is now a convenient time for you to answer some questions?

Is residential construction a primary focus of your business? (Note: Discontinue interview if residential construction is not identified as a primary focus of the company.)

1) I'll be reading a list of building materials, and I'd like you to indicate whether your company's use of each decking material over the past two years has *Increased*, *Remained the Same*, or *Decreased*.

Deck Material	Over Past Two Years, My Company's Use of Deck Material Has….. Increased	Remained the Same	Decreased	My Company Has Never Used This Product
Alaska Yellow Cedar	❑	❑	❑	❑
Western Red Cedar	❑	❑	❑	❑
Redwood	❑	❑	❑	❑
Preservative Treated Lumber	❑	❑	❑	❑
Untreated Lumber (excluding cedar/redwood)	❑	❑	❑	❑
Wood & Plastic Composite Lumber (e.g., Trex™)	❑	❑	❑	❑
Tropical Hardwoods	❑	❑	❑	❑
Plastic Lumber	❑	❑	❑	❑
Other: _____	❑	❑	❑	❑

2) I'll be reading the same list of materials, and I'd like you to indicate the overall percentage of each of those materials that were used by your company in deck substructures, surfaces, and accessories in the past year.

Deck Structural Material	Deck Substructure	Deck Surface	Deck Accessories
Alaska Yellow Cedar	____%	____%	____%
Western Red Cedar	____%	____%	____%
Redwood	____%	____%	____%
Preservative Treated Lumber	____%	____%	____%
Untreated Lumber (excluding cedar/redwood)	____%	____%	____%
Wood & Plastic Composite Lumber (e.g., Trex™)	____%	____%	____%
Tropical Hardwoods	____%	____%	____%
Plastic Lumber	____%	____%	____%
Other _____	____%	____%	____%
	100%	100%	100%

3) On a scale of 1 – 7 (1=not important at all and 7=extremely important), how important are the following building material attributes when building a deck?

Material Attributes	NOT IMPORTANT			NEUTRAL			EXTREMELY IMPORTANT
Long Life	1	2	3	4	5	6	7
Beautiful & Aesthetically Pleasing	1	2	3	4	5	6	7
Low Material Cost	1	2	3	4	5	6	7
Ease of Maintenance	1	2	3	4	5	6	7
High Workability/Ease of Use	1	2	3	4	5	6	7
Consistent Material Quality	1	2	3	4	5	6	7
Availability	1	2	3	4	5	6	7
Price Stability	1	2	3	4	5	6	7
High Strength Properties	1	2	3	4	5	6	7
Little Product Waste	1	2	3	4	5	6	7
Naturally Decay Resistant	1	2	3	4	5	6	7
Low Heat Retention in Service	1	2	3	4	5	6	7
Resistance to Splintering	1	2	3	4	5	6	7

4) This question refers to your relative perceptions of the following deck materials. For each material I read, please indicate the degree to which that material possesses each attribute. (Please provide your perception even if you have not used a specific material).

Deck Material Attribute	**Not At All**						**To a High Degree**
➢ Long Life							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ Beautiful & Aesthetically Pleasing							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ Ease of Maintenance							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ Availability							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ High Strength Properties							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ Low Material Cost							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7
➢ Natural Decay Resistance							
Alaska Yellow Cedar	1	2	3	4	5	6	7
Western Red Cedar	1	2	3	4	5	6	7
Redwood	1	2	3	4	5	6	7
Preservative Treated Lumber	1	2	3	4	5	6	7
Untreated Lumber (excluding cedar/redwood)	1	2	3	4	5	6	7
Wood/Plastic Composite Lumber (e.g., Trex™)	1	2	3	4	5	6	7
Tropical Hardwoods	1	2	3	4	5	6	7
Plastic Lumber	1	2	3	4	5	6	7

5) I'll be reading a list of information sources, and I'd like you to identify the two most important sources of information you use for learning about decking materials (please select **ONLY** two choices).

Information Sources

Builder Magazine	❑
Journal of Light Construction	❑
Professional Deck Builder Magazine	❑
Other Industry Magazines	❑
Trade Shows	❑
Word of Mouth	❑
Internet	❑
TV (e.g., Home Repair Shows)	❑
Retail Lumber Yards	❑
Home Center	❑
Other (Please Specify) _____	❑

6) Considering the sources you selected, which one do you consider to be your primary source of information?

_____

7) Who usually specifies the material for the decks you build?

Home Owner	_____ %
Deck Builder	_____ %
Home Builder	_____ %
Deck Designer	_____ %
Other: (Please specify)	
_____	_____ %
	100%

8) Have you used or considered using Alaska yellow cedar lumber to build a deck?

❑ Have Used ❑ Have Considered Using ❑ Never Used

b) If No, why? _____

_____

Finally, we would like some information about you and your company for statistical purposes.

★ *ALL SURVEY INFORMATION IS KEPT STRICTLY CONFIDENTIAL* ★

All identifying information (personal names, company names, and locations) is removed from the data

---

9) Approximately what percentage of the spec and custom homes that your company built in 2003 had a deck?

Percent of spec homes built with deck: _____ % Percent of custom homes built with deck: _____ %

10) What was the *average size* of the decks that your company built in 2003?

Average size of decks on spec homes: _____ ft^2 Average size of decks on custom homes: _____ ft^2

11) Please indicate the average construction cost *to your company* of the decks you built in 2003.

Average cost of spec home decks: $_____ Average cost of custom home decks: $_____

12) How many of the homes that you built in 2003 were custom homes and how many were spec homes?

_____ number of spec home

_____ number of custom homes

13) What percentage of the decks that you built in 2003 were subcontracted out? _____ %

14) Approximately how many years has your company been in business _____
(If respondent does not know or chooses not to respond, ask about the following ranges)

1. ❑ Less than 1
2. ❑ 1 – 3
3. ❑ 3 – 5
4. ❑ 5 – 10
5. ❑ 10 - 20
6. ❑ 20+
7. ❑ Other (_____)
8. ❑ Don't know/no response

15) Approximately what was your firm's total sales in 2003. *(please check only one)* _____
(If respondent does not know or chooses not to respond, ask about the following ranges)

- ❑ 0 - $500,000
- ❑ $500,001 to $1,000,000
- ❑ $1,000,001 to $2,500,000
- ❑ $2,500,001 to $5,000,000
- ❑ $5,000,001 to $10,000,000
- ❑ $10,000,001 to $20,000,000
- ❑ Over $20,000,000

16) What percentage of your firm's total sales in 2003 was derived from the following markets:

Single-family construction	_____ %
Multi-family construction	_____ %
Non-residential construction	_____ %
Repair and remodel	_____ %
Deck/Porch building	_____ %
Other, please specify(_____)	_____ %

17) In which state does your company conduct the majority of its business? _____

Thank You Very Much for participating in this survey.

APPENDIX C

Additional Data Tables

Table C1. Statistical comparison of home builders and deck builders material use in specific decking end-use applications.

Deck Substructure	Home Builder	Deck Builder
Alaska Yellow Cedar	0.7	0.0
Western Red Cedar	***3.4****	***0.7***
Redwood	***5.3****	***0.0***
Treated Lumber	***74.3****	***91.2***
Untreated Lumber	5.8	6.0
Wood-Plastic Composite	***7.1****	***0.6***
Tropical Hardwood	0.0	0.7
Plastic	0.2	0.0
Other	3.2	0.8
Deck Surface		
Alaska Yellow Cedar	0.2	0.9
Western Red Cedar	13.1	10.8
Redwood	***12.5****	***5.3***
Treated Lumber	***38.4****	***28.3***
Untreated Lumber	***0.2****	***1.5***
Wood-Plastic Composite	***27.9****	***39.6***
Tropical Hardwood	***1.4****	***5.8***
Plastic	***0.6****	***4.2***
Other	4.9	3.5
Deck Accessories		
Alaska Yellow Cedar	0.1	0.9
Western Red Cedar	17.4	17.5
Redwood	***14.3****	***6.6***
Treated Lumber	***37.5****	***27.8***
Untreated Lumber	2.6	1.8
Wood-Plastic Composite	***17.2****	***29.5***
Tropical Hardwood	***1.2****	***4.4***
Plastic	***1.6****	***4.8***
Other	8.1	5.6

Table C2. Statistical comparison by geographic region of material use in specific decking end-use applications.

Deck Substructure	Eastern US	Western US	West Coast
Alaska Yellow Cedar	0.8	0.0	0.0
Western Red Cedar	***0.7****	***3.9***	1.8
Redwood	***0.0****	***6.4***	1.0
Treated Lumber	***93.9****	***68.2***	75.1
Untreated Lumber	***0.5****	***11.4***	17.9
Wood-Plastic Composite	3.5	5.5	2.1
Tropical Hardwood	0.01	0.6	0.0
Plastic	0.0	0.3	0.0
Other	1.4	3.1	1.4
Deck Surface			
Alaska Yellow Cedar	0.4	0.6	1.0
Western Red Cedar	***9.0****	***15.5***	16.3
Redwood	***1.8****	***17.6***	20.0
Treated Lumber	***47.3****	***20.7***	6.7
Untreated Lumber	0.6	0.9	1.4
Wood-Plastic Composite	31.6	33.8	40.9
Tropical Hardwood	3.9	2.4	4.3
Plastic	2.7	1.5	0.2
Other	2.8	5.9	8.0
Deck Accessories			
Alaska Yellow Cedar	0.1	0.7	1.3
Western Red Cedar	***12.8****	***22.2***	26.2
Redwood	***2.8****	***20.4***	20.1
Treated Lumber	***49.3****	***18.2***	4.6
Untreated Lumber	***0.8****	***3.8***	6.4
Wood-Plastic Composite	20.1	23.3	25.5
Tropical Hardwood	2.0	2.7	5.1
Plastic	4.0	1.4	0.2
Other	6.4	8.1	12.3

Table C3. Average importance ratings for material attributes, by geographic region.

Material Attribute	Total Sample	Eastern US	Western US	West Coast
Long Life	6.28	6.23	6.34	6.39
Beautiful & Aesthetically Pleasing	6.14	6.05	6.23	6.21
Low Material Cost	5.09	5.06	5.11	4.88
Ease of Maintenance	5.69	5.68	5.69	5.70
High Workability/Ease of Use	5.41	5.42	5.40	5.16
Consistent Material Quality	6.23	6.17	6.29	6.16
Availability	6.07	6.07	6.07	5.93
Price Stability	5.67	5.80	5.55	5.34
High Strength Properties	5.27	5.32	5.21	4.97
Little Product Waste	5.06	5.14	4.97	4.85
Naturally Decay Resistant	5.87	5.88	5.86	5.80
Low Heat Retention in Service	4.01	4.12	3.90	3.91
Resistance to Splintering	5.16	5.15	5.16	5.24

Table C4. Average importance ratings for material attributes, by builder type.

Material Attribute	Home Builders	Deck Builders
Long Life	6.23	6.35
Beautiful & Aesthetically Pleasing	***6.02****	***6.29***
Low Material Cost	***5.53****	***4.49***
Ease of Maintenance	5.69	5.68
High Workability/Ease of Use	5.49	5.30
Consistent Material Quality	6.28	6.17
Availability	***6.29****	***5.76***
Price Stability	***5.91****	***5.34***
High Strength Properties	***5.41****	***5.08***
Little Product Waste	***5.25****	***4.80***
Naturally Decay Resistant	***5.99****	***5.71***
Low Heat Retention in Service	***3.66****	***4.50***
Resistance to Splintering	***4.81****	***5.63***

Table C5. Respondents average ratings related to the degree to which each decking product possesses a specific attribute.

	Long Life		Beauty		Maintain		Available		Strength		Low Cost		Nat'l Decay Resist	
	Home	***Deck***	***Home***	***Deck***	***Home***	***Deck***	***Home***	***Deck***	***Home***	***Deck***	***Home***	***Deck***	***Home***	***Deck***
AYC	***5.75***	***3.95***	***6.05***	***4.63***	***5.11***	***3.63***	***3.36***	***2.31***	***5.58***	***3.91***	***3.85***	***3.24***	5.75	4.35
WRC	***5.67***	***4.51***	***6.10***	***5.45***	***4.94***	***3.80***	***5.51***	***4.92***	***5.82***	***3.78***	***4.36***	***3.68***	5.51	4.70
Redwood	***5.95***	***4.72***	***6.30***	***5.69***	***5.22***	***3.92***	***5.41***	***3.86***	***5.87***	***4.08***	***3.90***	***3.37***	5.81	4.87
Treated	***5.64***	***5.29***	***4.45***	***3.23***	***5.04***	***3.75***	6.57	6.54	***6.09***	***5.62***	***5.55***	***4.82***	***5.64***	***5.68***
Untreated	2.30	2.29	***3.15***	***2.76***	2.49	2.38	***6.53***	***5.76***	***5.14***	***4.49***	***5.57***	***4.32***	1.84	2.18
WPC	6.18	6.12	***5.61***	***4.91***	***6.36***	***6.03***	***6.42***	***6.17***	***5.53***	***3.80***	3.83	3.98	***6.42***	***6.30***
Tropical	***5.93***	***5.41***	6.03	5.79	***5.42***	***4.78***	***5.18***	***4.31***	6.06	5.84	3.49	3.45	***5.86***	***5.57***
Plastic	5.79	5.51	***5.28***	***3.81***	5.95	5.61	***5.75***	***4.95***	***5.51***	***3.69***	***4.44***	***3.55***	***6.50***	***6.17***

(Note: 1=Not at all and 7=To a High Degree)

Table C6. Respondents average ratings related to the degree to which each decking product possesses a specific attribute, by geographic region.

	Long Life		Beauty		Maintain		Available		Strength		Low Cost		Nat'l Decay Resist	
	East	***West***	***East***	***West***	***East***	***West***	***East***	***West***	***East***	***West***	***East***	***West***	***East***	***West***
AYC	4.48	4.44	5.12	4.99	4.03	4.07	***2.41***	***2.91***	4.41	4.40	***2.99***	***3.79***	4.84	4.72
WRC	5.14	5.10	5.82	5.76	4.44	4.35	***4.95***	***5.57***	4.86	4.86	***3.60***	***4.51***	5.25	5.01
Redwood	5.36	5.41	5.95	6.09	4.63	4.59	***4.04***	***5.46***	5.09	4.98	***3.23***	***4.08***	5.46	5.32
Treated	5.51	5.48	***4.21***	***3.62***	4.44	4.54	***6.69***	***6.43***	***6.02***	***5.75***	5.22	5.26	5.67	5.64
Untreated	***2.07***	***2.51***	3.14	2.81	2.33	2.55	6.26	6.15	4.97	4.73	4.90	5.12	1.89	2.08
WPC	6.10	6.19	5.27	5.28	6.27	6.14	6.34	6.28	4.84	4.62	3.88	3.93	6.39	6.35
Tropical	5.54	5.64	5.98	5.75	5.02	4.97	4.46	4.84	5.96	5.89	3.39	3.53	5.70	5.63
Plastic	5.71	5.45	***4.72***	***3.83***	***6.01***	***5.42***	5.41	5.10	4.40	4.22	3.87	3.80	6.41	6.14

(Note: 1=Not at all and 7=To a High Degree)

Table C7. Specifier of decking materials, by industry and geographic sub-region.

Material Specifier	Home Builders			Deck Builders		
	East	Interior West	West Coast	East	Interior West	West Coast
Home Owner	31.2%	39.8%	25.8	48.7%	44.0%	52.8%
Deck Builder	14.8%	22.4%	4.9%	31.8%	30.2%	37.8%
Home Builder	45.9%	31.7%	50.4%	7.1%	12.1%	5.5%
Deck Designer	7.1%	2.6%	12.0%	9.5%	9.7%	3.9%
Other	1.1%	3.4%	6.9%	3.1%	4.1%	2.1%

Table C8. Specifier of decking materials, by geographic region.

Material Specifier	Total	Eastern US	Western US
Specified by Home Owner	39.3%	39.3%	39.3%
Specified by Deck Builder	22.3%	22.7%	21.9%
Specified by Home Builder	28.0%	27.8%	28.3%
Specified by Deck Designer	7.5%	8.2%	6.7%
Specified by Other	3.1%	2.0%	4.2%