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Strategic Analysis Identifying Opportunities for Exporting Montana's Wood Products to China

Micah Scudder
The University of Montana

**STRATEGIC ANALYSIS IDENTIFYING OPPORTUNITIES FOR EXPORTING
MONTANA'S WOOD PRODUCTS TO CHINA**

By

Micah Scudder

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ABSTRACT

STRATEGIC ANALYSIS IDENTIFYING OPPORTUNITIES FOR EXPORTING MONTANA'S WOOD PRODUCTS TO CHINA

By

Micah Scudder

The University of Montana, 2012

Under the Supervision of Tyron Venn

Montana's forest products industry has been experiencing declining production levels during the last two decades, with many mills struggling to survive due to declining harvest levels over the last two decades and the current low domestic demand. By diversifying wood product sales into new international markets, Montana wood product manufacturers would have an opportunity to increase their current production levels. To determine the potential export opportunities for Montana manufacturers in the Chinese wood product import market, a strategic analysis was conducted. The purpose of the strategy formulation for this research was to identify the position that Montana wood product manufacturers should take, in order to achieve the best possible sustainable competitive advantage for exporting their products to China. To facilitate this process, Montana's forest industry core competencies were identified and aligned with Chinese wood product import market opportunities to highlight strong growth prospects for the Montana wood products industry.

It was found that the Montana's log supply strengths primarily exist in the Douglas-fir, ponderosa pine, and lodgepole pine species, with the majority of the volume existing in small size classes (7.0"-14.9" diameter at breast height). The wood products that provided the best fit with Chinese import demands are dimensional lumber (2x4s), of these species. The predominant Chinese uses of these products are for concrete forms and furring strips, which are key components in concrete housing construction. The recommended target markets that Montana wood product manufacturers should pursue are the 2nd and 3rd tier lumber distributors that are

located in the 2nd and 3rd tier cites of the Shandong province. It is believed that this market provides an opportunity for future growth and decreased competition from industry rivals. The best opportunity to increase total export volumes of Montana wood products is through the creation of a wood product export coalition, licensed as an export trading company. The creation of this coalition increases the total chance of export success for Montana's wood product industry, while reducing the marketing cost and risk for individual manufacturers.

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Chapter 1
Introduction

1.1 Motivation for Research

Montana's forest products industry has been experiencing ongoing production challenges during the last two decades. Despite the fact that the wood/paper/furniture manufacturing sector made up 50% of Montana's labor income and 46% of employment in 1993, industry declines have reduced these proportions to 17% of income and 21% of employment in 2010 (Keegan, et al., 2004; Morgan, et al., 2012). Since 1990, approximately thirty Montana lumber mills have closed their doors, resulting in over 3,300 layoffs of lumber mill employees (Morgan, 2010). Of the remaining mills in Montana, the estimated 2011 lumber production was approximately 31.9 million cubic feet[1] (532 million board feet), which is about half of the amount produced in 2005 (Morgan, et al., 2012).

While the Montana wood product manufacturers are doing their best to survive until the domestic market improves, it is apparent that diversifying wood product sales into new international markets may provide an opportunity to improve Montana's forest industry by increasing current production levels. There are new wood product markets emerging that have the potential to promote resurgence in Montana's wood product industry.

Asian markets have recently shown a large increase in their wood product imports, with the most striking increase taking place in China. The other growing Asian wood product importers include Japan, Taiwan, South Korea, and India (Owen, 2012). This increase has been caused by growing populations, increased ease of international trade through new economic trade legislation, and increased wealth found in emerging markets (Owen, 2012). In 2007, China, Japan, Taiwan, and South Korea together imported 389 million cubic feet (MMCF) of lumber. By 2010 this amount had increased by 54% (Ekstrom, 2011). In 2011 China accounted for approximately 47% of the softwood lumber imports in Asia, followed by Japan at 29% (SEC, 2012). The distribution of 2011 softwood lumber imports to Asia is presented in Figure 1.1. An increasing focus on exports to Asia has already begun to take place in British Columbia,

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[1] The conversion of MBF to cubic feet utilized a board foot fiber ratio (BFFR) of 60 CF/MBF. This is the ratio used by the USFS timber assessment value for softwoods (Briggs, 1994). More information is provided on lumber conversion factors in section 1.5.

Washington, and Oregon (Owen, 2012). This rising trend of imports in Asia is an opportunity for Montana wood product manufacturers.

In an interview with private forestry consultants in Montana, it was revealed that the primary reasons that wood product manufacturers have not increased their export levels is that they do not know what types of products are in demand abroad and are wary of the inherent risks associated with conducting business internationally (Hayes, 2011; Rawlings, 2011). While increasing Montana's wood product exports is of large interest to many people involved in Montana's forest industry (Hayes, 2011; Rawlings, 2011), knowledge of the best path to get there remains in doubt.

The creation of strategic options for increasing export opportunities to Asian markets would be incredibly beneficial for Montana wood product manufacturers. At this time, many Montana forestry related businesses are suffering or disappearing as they wait for the U.S. housing market to recover. It is important to begin to look for other market opportunities in order to preserve the remaining wood production capacity of this state. By implementing a strategic analysis process, a portfolio of options can be formed for the benefit of wood product manufacturers in Montana.

Figure 1.1: 2011 Softwood lumber import values of Asian countries (US$1000s)
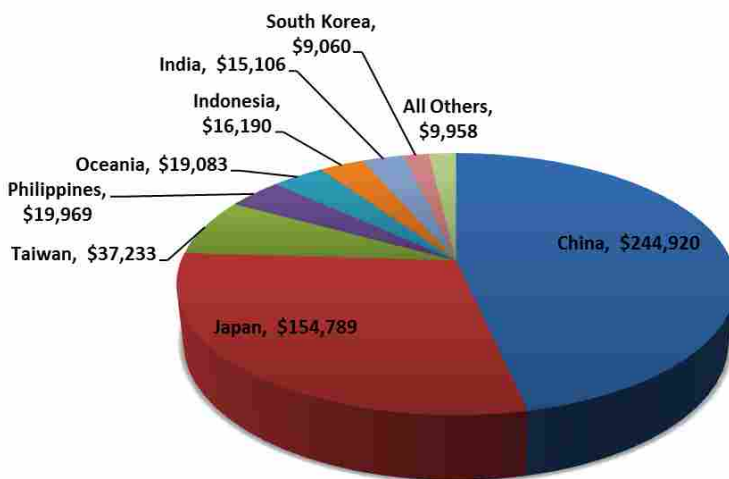
Source: SEC (2012).

1.2 Methodological Overview of this Research

Business strategy is about positioning a group or organization for a sustainable competitive advantage. It involves choosing which industries to participate in, which products and services to provide, and how best to allocate resources in order to create a sustainable competitive advantage (De Kluyver, 2012).

The process of strategy formulation involves developing an understanding of the current situation, deciding where to go, and choosing the best path to take. Creating an understanding of the current situation requires a focus on a resource based view for strategic thinking. This involves an analysis of a group's or organization's resources in order to identify the core competencies that are hard to imitate and cannot be easily substituted (De Kluyver, 2012). By leveraging these core competencies, a sustainable competitive advantage can be realized. A market economic analysis of the potential export market allows for a greater understanding of the external factors that dictate potential opportunities and challenges, such as past product demand trends, future demand expectations, regulatory issues, and socio-cultural values (De Kluyver, 2012). In order to understand the success potential for a chosen industry, it is also necessary to assess the competitive rivalry within that particular industry. This assessment is referred to as Porter's five forces model (Porter, 2008), and involves looking at the threat of new entrants to the industry, the power of suppliers, the power of buyers, threat of substitute products or services, and the existing rivalry among participants (De Kluyver, 2012). By combining a resource assessment, a market economic environment assessment, and an industry 5 forces model, an analysis of strengths, weaknesses, opportunities, and threats (SWOT), can be created. A SWOT analysis is a method that identifies a group's or organization's strengths and weaknesses, and the opportunities and threats that exist for exporting to a particular environment in a particular industry (De Kluyver, 2012). From this SWOT analysis, a portfolio of strategic options can be identified based on products produced, and target markets served, and industry position taken. An evaluation of this portfolio can ascertain which strategic options in the portfolio provide the best fit based on resource capabilities and a comparison of risk versus reward.

1.3 Objectives and Justification of Research

The purpose of this research thesis is to develop a strategic analysis for increasing Montana's exports of wood products to China. The specific objectives of this thesis follow the seven step strategy formulation process presented by (De Kluyver, 2012), which is presented in Figure 1.2.

Figure 1.2: Seven step strategic formulation process for increasing Montana wood product exports
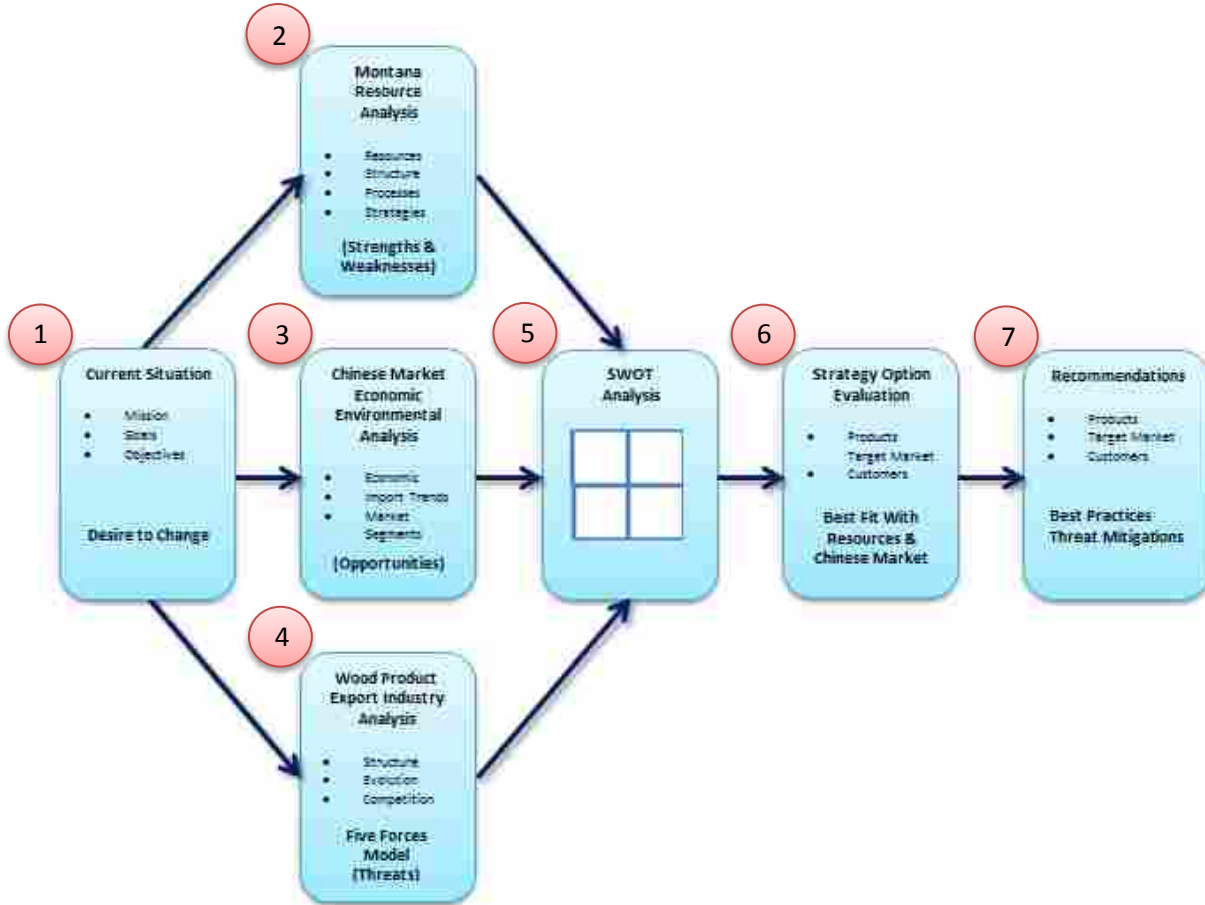
Source: Adapted from De Kluyver (2012).

The completion of this strategy formulation will provide Montana wood product manufacturers with a strategy that that can be used for guidance in exporting their products. China was chosen as the sole focus of this thesis because it is currently the largest importer of wood products in Asia. An export assessment of the Chinese market will provide Montana wood product manufacturers with an in depth strategic analysis on the Montana wood products that are most likely to be successful for long-term sales to China and the Chinese target markets that

present the largest opportunity for future demand. This strategic formulation will provide Montana wood product manufactures with an opportunity to sell their products to a new market, gain new customers, and increase their production schedules. An increase in sales of Montana wood products will also raise the demand for raw timber, which will provide an opportunity to finance the cost of forest management operations. The value of increased sales would trickle down to all aspects of Montana's forest industry and would result in job creation for both the wood product manufacturing sector and the forest management sector. This strategic analysis will provide a plan that can assist in improving the production levels Montana's forest products industry.

The second chapter of this thesis looks at the current situation of Montana's forest industry in regards to production levels and refers to step one in Figure 1.1. Chapter three of this thesis provides a resource assessment of Montana's forest industry infrastructure and refers to step two in Figure 1.1. The topics presented are the raw timber availability, harvest trends in Montana by species, product production trends, and the primary wood product manufacturers. The fourth chapter of the thesis provides a market economic analysis of China's wood product import market and refers to step three in Figure 1.1. Presented in this chapter is a description of China's forest industry, which includes the country's raw material availability, domestic timber supply versus domestic demand and a description of the manufacturing capabilities and locations. This is followed by an analysis of China's softwood lumber imports, the product uses, the real estate market trends, growing markets, and distribution channels. Chapter five provides a wood product export industry assessment utilizing Porter's 5 Forces Analysis (Porter, 2008), and refers to step four of Figure 1.1. The five forces categories are the threat of new entrants to the Chinese export industry, the power of suppliers, the power of buyers, the threat of substitute products or services and the existing rivalry among participants.

In chapter six, the findings of chapter three, four, and five are utilized for the creation of a SWOT analysis for exporting Montana wood products to China, which represents step five of Figure 1.1. The topics discussed are Montana's forest industry strengths and weaknesses, opportunities for Montana wood product exports to China based on the market economic analysis of China's wood product import market, and the potential threats for exporting to China based on the findings of the Porter's 5 Forces Analysis. Chapter seven presents step six of Figure 1.1 and provides an evaluation of export opportunities that provide the best fit with

Montana wood products based on the findings of the SWOT analysis. In this chapter, discussion is provided on the potential products, geographic target markets segments, and customer segments. Chapter eight provides a recommendation of products to export and geographic and customer segments to target, that Montana wood product manufacturers should focus on for initiating export sales to China. This is the seventh strategy formulation step represented in Figure 1.1. In chapter nine, additional export best practices are discussed to improve the probability of success of the recommended strategy. In addition, mitigation strategies are presented for the threats discovered in Porter's 5 Forces analysis conducted in chapter five. Chapter ten concludes with a summary of this strategic analysis for increasing Montana's exports of wood products to China, as well as limitations of this research and future research needs.

1.4 A Note on Research Methods and Log & Lumber Volume Conversion Factors

The research methods for investigations and strategic tools utilized in chapters three through seven are discussed at the beginning of each chapter they are conducted in. The resources utilized for this research thesis were from scientific journals, texts authored by forest scientists, trade journals, government collected statistics and reports, presentations by export industry specialists, and interviews with forest industry specialists. In some cases, more detailed Chinese import data and Chinese industry statistics were available, but the cost for purchase was in the thousands of U.S. dollars.

The log and lumber volumes presented in this thesis were all converted to cubic feet (CF). The data collected during the research process was typically reported in cubic meters (m³) for Chinese import volumes, cubic feet for Montana timber supply volumes collected from USFS FIA data, and thousands of board feet (MBF) or thousands of square feet (MSF) for Montana lumber and panel production. Cubic foot volumes were chosen as the common unit for this thesis because it allows for a more direct comparison between the data collected. In addition, cubic foot volumes present a more accurate assessment of log volumes than the Scribner board foot method. The Scribner method gives a relatively high under-estimate for logs under 14 inches in diameter. This results in the board foot volume of lumber produced being greater than the board foot volume of log scale or volume measurements of the logs delivered to the mill (Husch, et al., 2003).

For this thesis, lumber volume conversions were taken from lumber product conversion factors presented by Briggs (1994). The conversion factor utilized for changing cubic meters (M³) to cubic feet (CF) is 35.315 CF per M³. Converting board foot volumes to cubic foot volumes is not as simple due to the fact that the lineal foot volumes of lumber products with different dimensions have different board foot and cubic foot values. The lineal foot volumes for various dimensional lumber sizes in board feet and cubic feet are presented in Table 1.1. Whenever possible, volume conversions from board feet to cubic feet in this thesis utilized the conversion factor for the specific lumber dimension. When this was not possible, a conversion factor of 60 CF per MBF was used. This is the USFS timber assessment value for softwoods (Briggs, 1994), and represents an approximate average of all the lumber dimensions presented in Table 1.1.

Table 1.1: Board feet to cubic feet conversion factors per lineal foot

Nominal Dimension		Board Ft./Cubic Foot	Cubic ft./MBF
Thickness	Width	Sufaced Dry	Sufaced Dry
1	4	18.29	54.67
1	6	17.45	57.31
1	8	17.66	56.63
1	10	17.3	57.80
1	12	17.07	58.58
2	4	18.29	54.67
2	6	17.45	57.31
2	8	17.66	56.63
2	10	17.3	57.80
2	12	17.07	58.58
3	4	16.46	60.75
3	6	15.71	63.65
3	8	15.89	62.93
3	10	15.57	64.23
3	12	15.36	65.10
4	4	15.67	63.82
4	6	14.96	66.84
4	8	15.13	66.09
4	10	14.83	67.43
4	12	14.63	68.35

Source: Briggs (1994).

Board foot to cubic foot conversions for logs varies by tree size. Generally, the ratios will increase rapidly from small diameters to large diameters. Eventually the ratios level off at the larger diameters (Husch, Beers, & Kershaw, 2003). Choosing one fixed conversion factor

will result in error being dependent on the level of variation in diameters of logs being utilized. For this thesis, a fixed conversion was taken from Forest Industries Data Collection System (FIDACS) research conducted by the Bureau of Business and Economic Research (McIver, et al., 2012). This fixed conversion is based on the most recent FIDACS research conducted for Montana timber products. The process for developing this conversion factor involved calculating the total wood product and residue cubic foot volume output produced by sawmills in Montana. These product and residue cubic volumes were then compared to the scaled board foot log volume inputs delivered to these mills (Keegan, 2012). This allowed for a BF to CF conversion factor for saw logs. In this thesis, factors developed by McIver, et al., (2012) have been adopted, which are, 4.04 board feet Scribner per cubic foot and 247.67 cubic feet per MBF Scribner (Keegan, 2012).

It was also necessary to convert panel products from thousand square feet (MSF) to cubic feet. For plywood conversions, a factor of 31.25 CF per MSF was used. This factor was presented by Briggs (1994), and is for panels with a thickness of 3/8" and a width and length of 4' by 8'. For particle board and MDF conversions, a factor of 62.5 CF per MSF was used. This factor was presented by Briggs (1994), for panels with a thickness of ¾" and a width and length of 4' by 8'. The panel dimensions presented here are the most common dimensions for volume comparisons in the U.S.

Chapter 2

Current Situation of Montana's Forest Industry
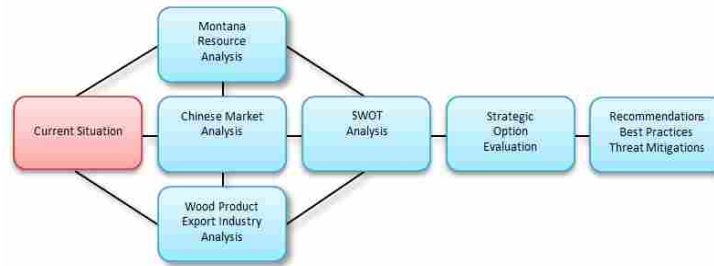
2.1 Chapter Objectives

Assessing the current situation of Montana's forest industry is the first step in conducting the strategic formulation process. The chapter objectives are to: (a) identify the current level of wood product production in Montana and assess how this compares to levels in the recent past; (b) discover the root causes for the current condition; (c) and consider the potential future if the current situation continues.

2.2 The Decline of Montana's Forest Product Industry

Montana's forest products industry has been experiencing ongoing production challenges during the last two decades. Despite the fact that this sector once made up a significant portion of Montana's economy, the annual production of wood products in Montana has steadily declined, even while markets for these products were strong and increasing (Morgan, et al., 2012). Since 1990, thirty Montana lumber mills have closed their doors, resulting in over 3,300 layoffs of lumber mill employees (Morgan, 2010). Missoula County recently lost two large companies in the forestry sector. The closure of Smurfit-Stone in 2010, a craft-paper mill in Frenchtown, left 417 employees out of work. Due to the closure of Smurfit-Stone, Montana Rail Link was forced to lay off 42 employees (Morgan, 2010). Stimson Lumber in Bonner also shut down in 2008, which resulted in 115 employees being laid off (Morgan, et al., 2012). It should be noted that these numbers only reflect the number of employees that were laid off at the time of closure. It is likely that many others were laid off prior to the mill closures. Even the remaining mills are experiencing a decline their workforce. In September 2011, the Roseburg

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Forest Products facility in Missoula announced that it would be downsizing their workforce by 20 employees (Holyoak, 2011). As can be viewed in Figure 2.1, the state's lumber production between 1999 and 2011 has had an average annual decline of 7%.   The estimated 2011 lumber production was 31.9 MMCF (532 MMBF), which is about half of the amount produced in 2005 (McIver, et al., 2012).

Figure 2.1: Montana annual lumber production 1999 – 2011 (Cubic feet)
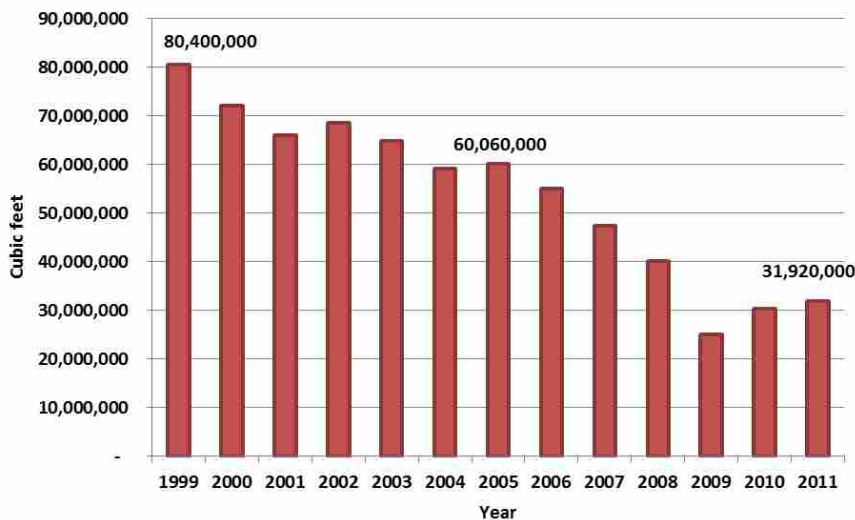
2.3 Explanation for Industry Decline & Expected Industry Future

The primary reasons stated for this decline of Montana's forest industry by local forest economists and forestry consultants are the reductions in timber harvests levels and an over-dependence on the domestic market for wood product sales. The reduction of timber harvest levels is attributed to the long-term decline of this industry and is associated with public policies regarding public land management and inventory issues on private lands (Hayes, 2011; Rawlings, 2011). These harvest declines began to occur in 1988 and have existed to the present time in 2011. Total annual timber harvests for Montana from 2009 to 2011 are at their lowest levels since 1945 (Morgan, et al., 2012). These harvest declines are presented in Figure 2.2.

Figure 2.2: Montana total timber harvest volumes (Cubic feet)
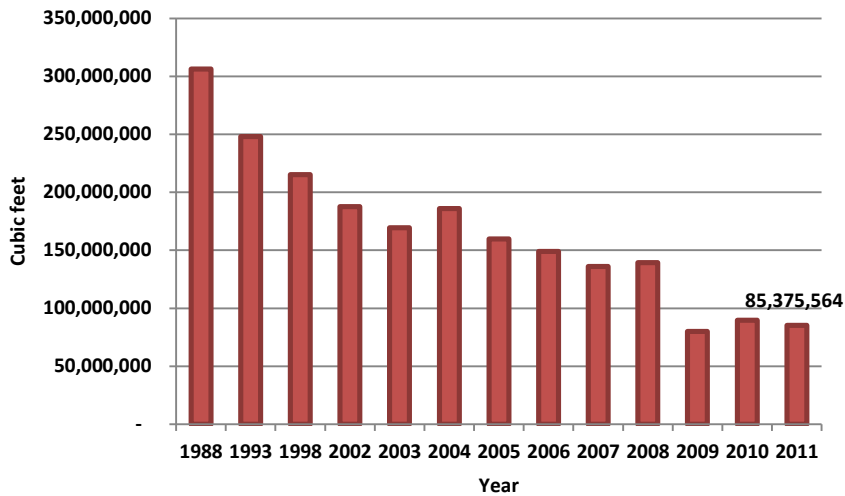
The more recent declines of Montana's wood product industry have been attributed to an over-dependence on the U.S. market. With a primary focus on the domestic market for lumber sales, the collapse of the U.S. housing market between 2006 and 2009 created sales challenges for Montana manufacturers. U.S. housing starts in 2009, 2010, and 2011 were at the lowest levels ever recorded (NAHB, 2012). Annual U.S. housing starts for the last decade are presented in Figure 2.3. Data collected by the National Association of Home Builders indicates that there were minimal gains in number of annual U.S. housing starts during 2010 and 2011. While forecasts estimate that the growth level will improve during 2012 and 2013, the total starts will still be well below pre-recession numbers (NAHB, 2012).

Morgan et al. (2012) indicated that a wood products industry recovery in the near term is unlikely due to the slow recovery of the U.S. housing market. Domestic trade flow forecast data from the U.S. Department of Transportation is pessimistic, indicating that Montana's wood product domestic trade flows will have declined by 33% in 2015 when compared to levels in 2007 (FAF, 2011). By primarily relying on the domestic market, Montana's forest products industry may continue to experience a slow recovery or possibly decline further.

Figure 2.3: U.S. annual housing starts 2000 – 2011 & forecasts (Forecasts in blue)
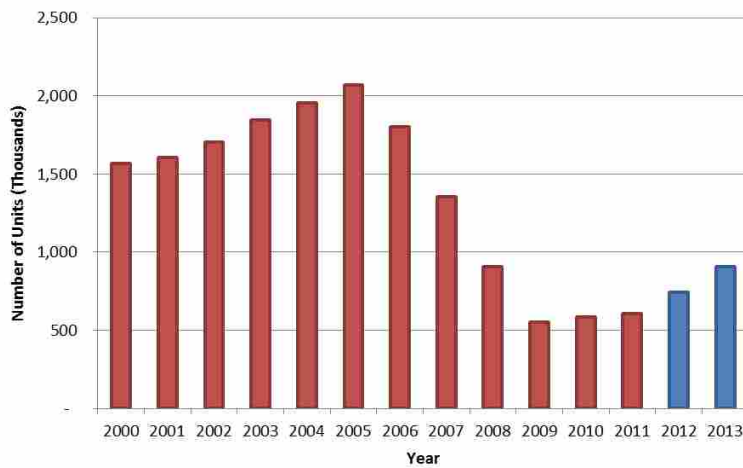
Source: NAHB (2012).

Through the completion of a current situation assessment of Montana's forest industry, it has been found if the Montana wood products industry continues to rely on the domestic market only, it is likely to experience further declines. The problem with continuing declines in this industry is that many forest management activities rely on revenues generated from the sale of wood products to fund their costs. Forest management activities are necessary for the maintenance of healthy forest ecosystems, as well as mitigating threats of wildland fires in the wildland-urban interface. Identifying new potential markets for Montana's wood products has become a source of interest to many industry stakeholders and participants (Hayes, 2011; Rawlings, 2011), and is the focus of this research thesis.

In 2012, the Forest Business Network partnered with the Montana World Trade Center[2] to initiate a reverse trade mission focused on inviting foreign trade delegates to Montana to meet with Montana wood product manufacturers. This reverse trade mission is expected to occur in March of 2013 and has the objective of increasing Montana wood product exports. The next step to take for increasing the possibility of identifying export opportunities for Montana wood products is to conduct a resource analysis of Montana's forest industry infrastructure.

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[2] The Montana World Trade Center acts as a consultant for Montana businesses by assisting them with the establishment of international commercial capabilities, while striving to develop untapped international trade opportunities.

Chapter 3

Montana Forest Infrastructure Resource Analysis
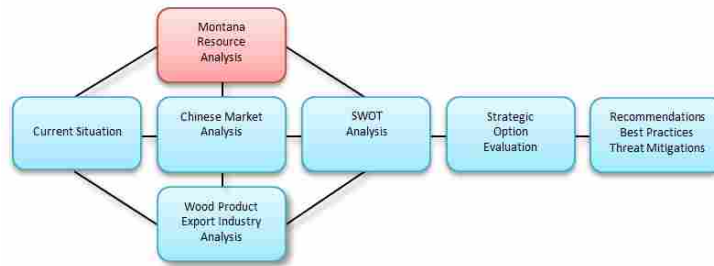
3.1 Chapter Objectives

The purpose of this chapter is to develop a resource based strategic view for understanding Montana's forest industry. Resource based strategic theory is based on understanding the resources available to a firm, the firm's capabilities, and finally the firm's competencies (Javidan, 1998). This allows for a better understanding of the sources of a competitive advantage, which can lead to a better match to external opportunities. In addition, a resource based strategic view allows for the identification of strengths and weaknesses. The first objective of this chapter is to identify the timber resources available by determining the extent of the raw timber supply, forest growth rate trends, the tree species predominantly harvested, timber harvest by ownership class, the dominant geographic harvest locations, and log price trends. The second chapter objective is to identify the capabilities of Montana's forest industry by assessing the primary manufacturer's locations, products produced, sustainable certifications, market outreach, and distribution capabilities. The third chapter objective is to determine the key competencies that exist for Montana's forest industry. The completion of these objectives will allow for a better understanding of the export opportunities to China that will provide the best fit with Montana's resources.

3.2 Standing Net Harvestable Timber Volume

In the state of Montana there is an abundant supply of raw timber that is available for harvest. Research conducted by Spoelma, et al., (2008), estimated that the standing volume of non-reserved timber in Montana was approximately 32,351 MMCF (130,700 MMBF Scribner). Of this amount, approximately 32% of the standing volume is Douglas-fir, 18% is lodgepole

pine, 15% is Engelmann spruce, and 11% is ponderosa-pine (Spoelma, et al., 2008). The annual net growth of the standing volume was estimated to be 668.3 MCF (2.7 MMBF Scribner) per year. Of this amount, lodgepole pine accounts for approximately 25% of the net growth, followed by Douglas-fir at 22%, Engelmann spruce at 15%, and ponderosa pine at 11% (Spoelma, et al., 2008). What was not specified in this research was whether or not this non-reserved timber could be potential net harvestable volume when considering the feasibility constraints of logging operations.

In order to estimate net harvestable volume of timber by species, diameter, and land ownership class, forest inventory information was retrieved from the Interior West Forest Inventory and Analysis Program of the USDA Forest Service (IW-FIA, 2009). Timberland was chosen as the land classification for the forest inventory information retrieved because it represents non-reserved forest land that is not withdrawn from management for production of wood products through statute or administrative designation. Timberland is defined by IW-FIA as,

> *Land that is at least 10 percent stocked with live tally tree species (timber or woodland species), including land that formerly had such stocking and that may be regenerated naturally or artificially. The minimum area for classification of forest land is 1 acre and 120-feet wide. Unimproved roads, trails, streams, and openings in forest areas are classified as forest land if they are less than 120-feet wide or 1 acre in size. For field use, sufficient tree crown cover (5 percent cover of tally tree species), or the presence of sufficient reproduction (40 tally tree species seedlings/saplings per acre), is used to represent 10 percent stocking… Timberland – a subset of forest land where the designated forest type is derived from timber species* (IW-FIA, 2001).

Growing-stock trees were chosen as the primary variable for the inventory retrieval and is defined by IW-FIA (2009), as, "A live timber species, 5.0 inches DBH or larger, with less than 2/3 (67 percent) of the merchantable volume cull, and containing at least one solid 8-foot section, now or prospectively, reasonably free of form defect, on the merchantable portion of the tree" (IW-FIA, 2009). Cubic foot volume was chosen as unit of measure and is defined by IW-FIA (2009) as, "The merchantable portion of a timber species tree; the merchantable portion includes that part of a bole from a 1-foot stump to a minimum 4-inch top, diameter over bark" (IW-FIA, 2001). Net cubic-foot volume is calculated as the gross cubic-foot volume in the merchantable portion of a tree, less deductions for cull.

The FIA tool that was utilized for the data extraction was the *EVALIDator Version 1.5.1.2a, using 2009 data* (IW-FIA, 2009). The query option that was chosen was *net volume of*

growing-stock trees (at least 5 inches d.b.h.) in cubic feet, on timberland. The query selection included *species, 0.5 miles or less distance to road, and current 2 to 40 inch diameter class*. The additional filters used were *forest stands being ≤ 100 years[3] and > than 0 years, slope condition ≤ 40% and ≥ 0%, and tree diameter at breast height ≥ 7 inches and ≤ 50 inches.* The results of this query are presented in Table 3.1.

Table 3.1 Net cubic foot volume of growing stock trees on timberland by species and ownership class (MMCF)

	National Forest	Other Federal	State & Local Gov.	Private	Total
Douglas-fir	495.4	16.4	40.0	357.8	909.6
Lodgepole pine	657.1	0.0	20.5	118.0	795.6
Ponderosa pine	297.6	11.3	40.1	288.0	637.0
Western larch	247.1	0.0	17.6	73.9	338.6
Engelmann spruce	209.0	8.1	3.5	62.9	283.5
Subalpine fir	73.9	0.0	0.0	16.5	90.3
Grand fir	48.7	0.0	10.4	26.2	85.4
Western hemlock	31.7	0.0	0.0	0.6	32.2
Western redcedar	11.4	0.0	1.4	13.6	26.4
Western white pine	11.5	0.0	0.0	0.2	11.8
Limber pine	1.3	0.0	0.1	1.4	2.8
Whitebark pine	1.3	0.0	0.0	0.0	1.3
Total	2,086.0	35.8	133.7	959.1	3,214.6

Source: IW-FIA (2009).

As can be seen in Table 3.1, there are five dominant tree species that make up the total volume of timber that can potentially be harvested based on the applied logging constraints. *Pseudotsuga menziesii* (Douglas-fir) is the species with the largest total volume representing 28% of the total. This is followed by *Pinus contorta* (lodgepole pine), which represents 25%, *Pinus ponderosa* (ponderosa pine) at 20%, *Larix occidentalis* (western larch) at 11%, and *Picea engelmannii* (Engelmann spruce) at 9%. The information obtained from the IW-FIA (2009), was separated further to reveal the diameter distribution by size class and ownership class. Figure 3.1 presents the cubic foot volume of timber existing on national forest land. Figure 3.2 presents the cubic foot volume of timber existing on private land. Figure 3.3 presents this information for Other Federal Timberland and Figure 3.4 presents this information for State and Local Government Timberland.

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[3] The 100 year age limit was chosen in order to eliminate the proposal of harvesting trees that could be considered old growth.

In Figure 3.1, it can be seen that lodgepole pine represents the greatest amount of cubic foot volume with the predominant amount existing in the 7.0 – 8.9 inch size class, followed by the 9.0 – 10.9 inch and 11.0 – 12.9 inch size classes. These three size classes of lodgepole pine represent 607.3 million cubic feet, which is 29% of the total cubic foot volume of harvestable timber on National Forest land. Douglas-fir in the 7.0-14.9 inch size classes is the next category visible in Figure 3.1 that represents a large volume. The total volume of Douglas-fir for size DBH between 7.0 and 14.9 inches is 326.5 million cubic feet, representing 16% of the total cubic foot volume of harvestable timber on National Forest land.

In Figure 3.2, it is apparent that Douglas-fir exemplifies the largest available volume especially in the size range of 7.0 to 16.9 inches. This volume totals to 307.2 MMCF, which represents 32% of the total timber volume available on private timberlands. Ponderosa pine is the species with the next largest volume available, specifically in the DBH class between 9.0 and 16.9 inches. This range of size classes represents 172.4 MMCF, which is 18% of the total timber volume available on private timberlands.

Figure 3.1: Montana National Forest timberland volume of growing stock trees by species and Diameter class (Cubic Feet)

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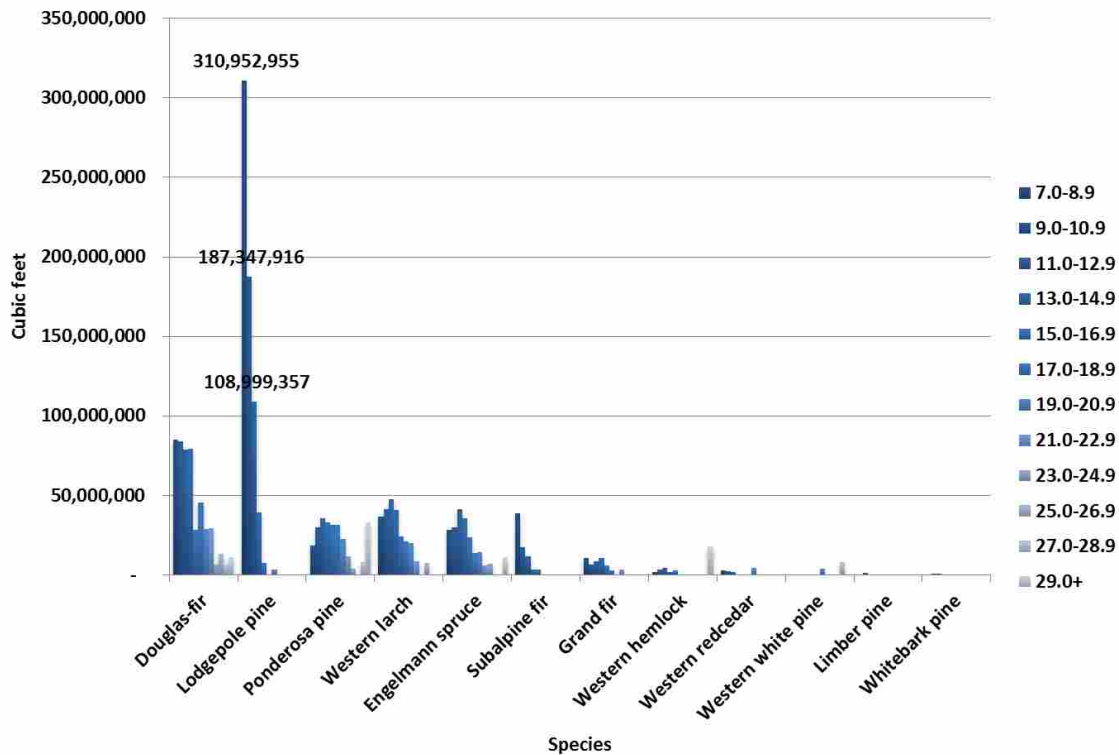
Figure 3.2: Montana private timberland volume of growing stock trees by species and diameter class (Cubic feet)
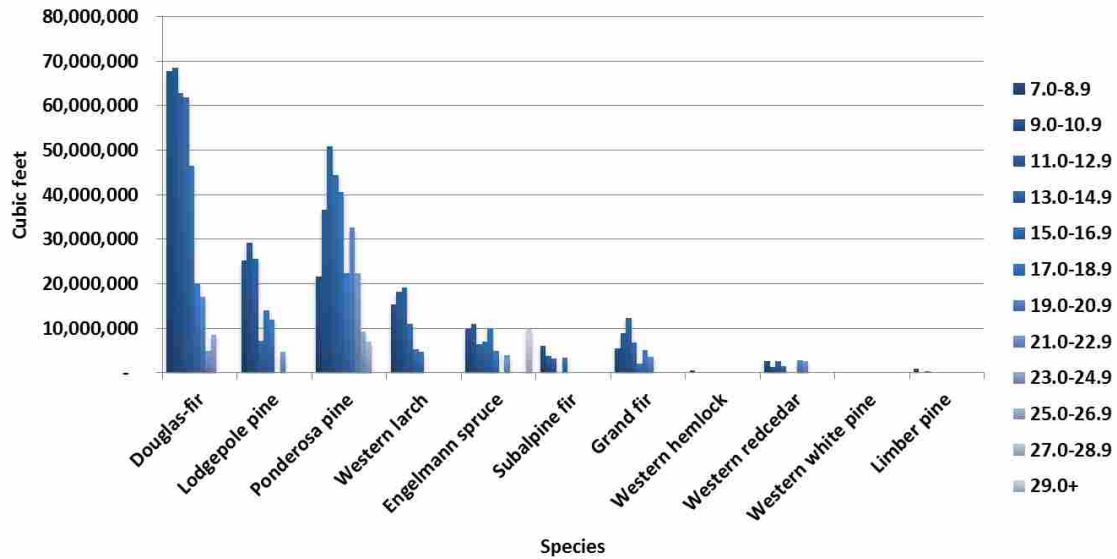
Figure 3.3: Montana other Federal timberland volume of growing stock trees by species and diameter Class (Cubic feet)
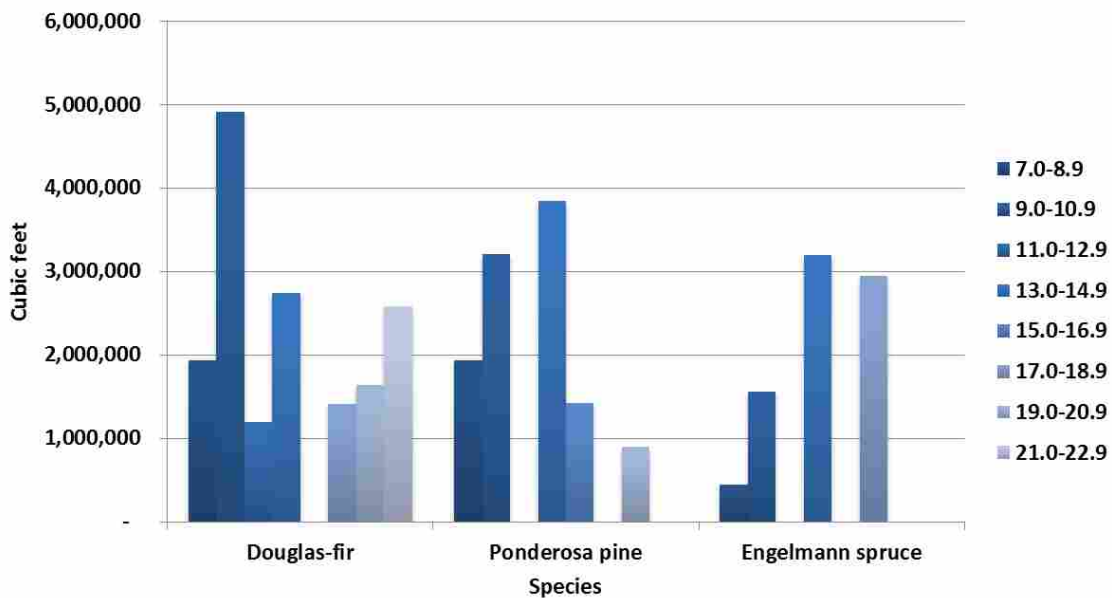
Figure 3.4: Montana State & local government timberland volume of growing stock trees by species And diameter class (Cubic feet)
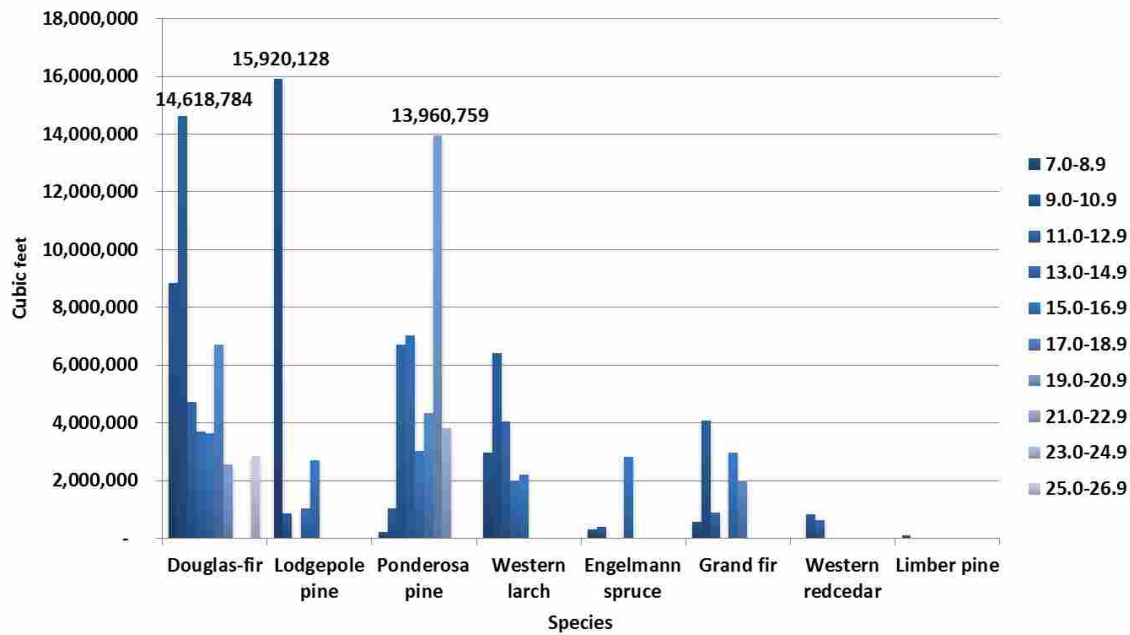
The volume of timber available for harvest on Other Federal and State and Local Government timberlands is much smaller than what is available on National Forest lands and Private lands. The largest categorical volume on Other Federal timberlands was Douglas-fir in the 9.0 to 10.9 inch size class. This category totals 4.9 million cubic feet, which is 14% of the total available timber existing on Other Federal lands. On State and Local Government timberlands the largest volume categories are small diameter lodgepole pine and Douglas-fir. Lodgepole pine in the 7.0 to 8.9 diameter class totaled 15.9 million cubic feet, which was 12% of the total available timber existing on State and Local Government timberlands. Douglas-fir between 7.0 and 10.9 inches DBH totaled 23.4 MMCF, which was 18% of the total available timber existing on State and Local Government timberlands. The third largest category existing on State and Local Government was ponderosa pine between 23.0 and 24.9 inches DBH, which totaled 13.9 MMCF.

An analysis of the data collected from IW-FIA reveals that there is an abundant supply of small-diameter (7.0"-14.9" DBH) timber among lodgepole pine, Douglas-fir, and ponderosa pine, that available for harvest on Montana timberlands. The total amount of lodgepole pine existing between 7.0 and 14.9 inches DBH is 751.5 MMCF, representing 95% of the total net

harvestable lodgepole pine volume. This was followed by Douglas-fir at 629.9 MMCF, which represented 69% of the total net harvestable Douglas-fir volume. The volumes of small diameter (7.0"-14.9") of ponderosa pine were 293.9 MMCF, which represented 46% of the total net harvestable volume of ponderosa pine. A breakdown of the ownership distribution of the small diameter (7.0"-14.9") volumes of these three species is presented in Figures 3.5, 3.6, and 3.7.

Figure 3.5: Ownership class distribution of lodgepole pine in 7.0 – 14.9 inch size class (Total volume 751,559,410 cubic feet)
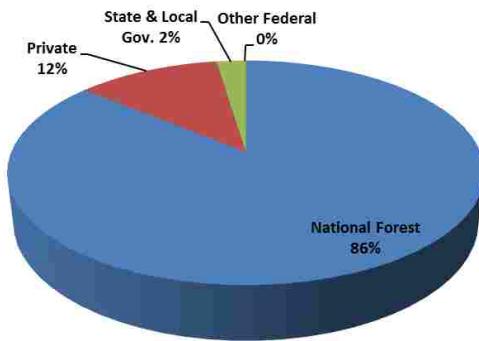
Source: IW-FIA (2009).

Figure 3.6: Ownership class distribution of Douglas-fir in 7.0 – 14.9 inch size class (Total volume 629,950,346 cubic feet)
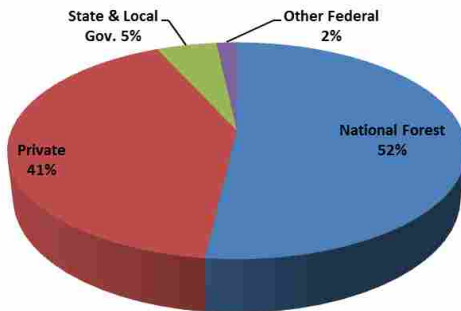
Source: IW-FIA (2009).

Figure 3.7: Ownership class distribution of ponderosa pine in 7.0 – 14.9 inch size class (Total volume 293,972,212 cubic feet)
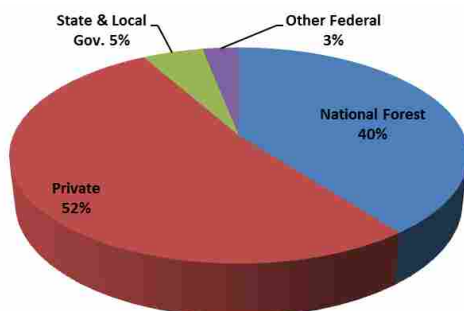
As was previously stated, there exists a total volume of 35,943 MMCF of non-reserved timber in Montana. It was found that of this amount, the net harvestable volume based on logging constraints is 3,215 MMCF, which represents approximately 9% of the total. It was found that the primary species that make up this net harvestable volume are Douglas-fir, lodgepole pine, and ponderosa pine. The strength of the timber supply for these three species is predominantly in the small diameter classes (7.0"-14.9"), which represent approximately 70% of their total net harvestable volume. It was found that Montana's 2011 timber harvest volumes represent approximately 2.7% of the total net harvestable volume and 0.24% of the total standing timber volume. Based on these findings, it is determined that there is a large amount of timber available for additional harvest in Montana. More information on Montana's timber harvest volumes is provided in chapter section 3.4.

3.3 Net Annual Growth of Timber Stands

In order to get an estimation of the potential future available timber volumes in Montana, the annual net growth of growing stock trees was collected from IW-FIA. This annual net growth represents gross timber growth, minus average annual mortality, and minus timber harvest removals.

This inventory was also retrieved by using EVALIDator Version 1.5.1.2a, with 2009 data. The query option that was chosen was *average annual net growth of growing stock trees (at least 5 inches d.b.h.) in cubic feet, on timberland.* The query selection included *species, 0.5 miles or less distance to road, and current 2 to 40 inch diameter class*. The additional filters used were *forest stands being ≤ 100 years and > than 0 years, slope condition ≤ 40% and ≥ 0%, and tree diameter ≥ 7 inches and ≤ 50 inches.* The results of this query are shown in Figure 3.8.

Figure 3.8: Montana timberland average annual net growth of growing stock trees by Species and diameter class on all ownership classes (Cubic feet)
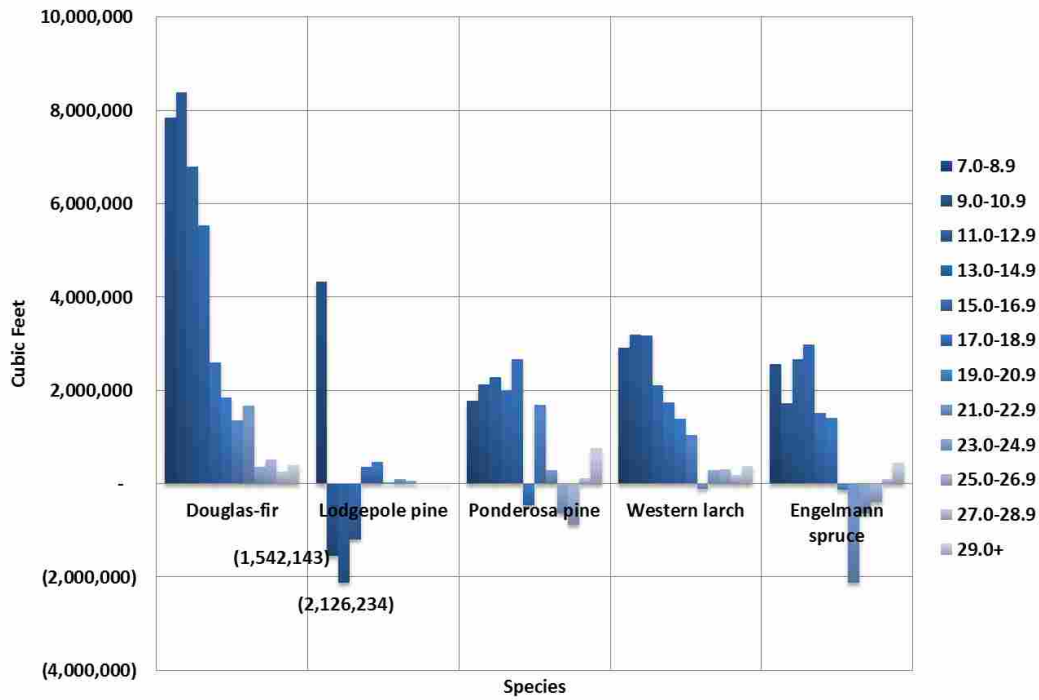
Source: IW-FIA (2009).

As can be seen in Figure 3.8, the species diameter category with the largest average annual net growth is Douglas-fir between 9.0 and 10.9 inches DBH, which totals 8.3 MMCF across all ownership classes. The majority of the tree species presented display expected growth patterns that decline with larger size classes and experience negative net growth at the largest size classes due to tree mortality. The largest irregularity in this figure is the negative net growth of lodgepole pine for DBH between 9.0 and 12.9 inches, which indicates high levels of mortality occurring in the small diameter size classes.

In order to get a clarification of the tree mortality levels, a third query was run using *EVALIDator Version 1.5.1.2a, with 2009 data.* The query option chosen was the *number of standing-dead trees (at least 5 inches d.b.h./d.r.c.), in trees, on timberland.* The query selection included *species, distance to road, and current 2 to 40 inch diameter class*. The additional filters used were *forest stands being ≤ 100 years and > than 0 years, slope condition ≤ 40% and ≥ 0%, and tree diameter ≥ 7 inches and ≤ 50 inches.* The number of standing-dead trees by species is presented in Figure 3.9[4]. As can be seen in this figure, lodgepole pine largely exceeded the other four species for number of standing dead trees, specifically in the size classes between 7.0 to 12.9 inches DBH.

Figure 3.9: Number of standing-dead trees by species and diameter class across all ownership classes
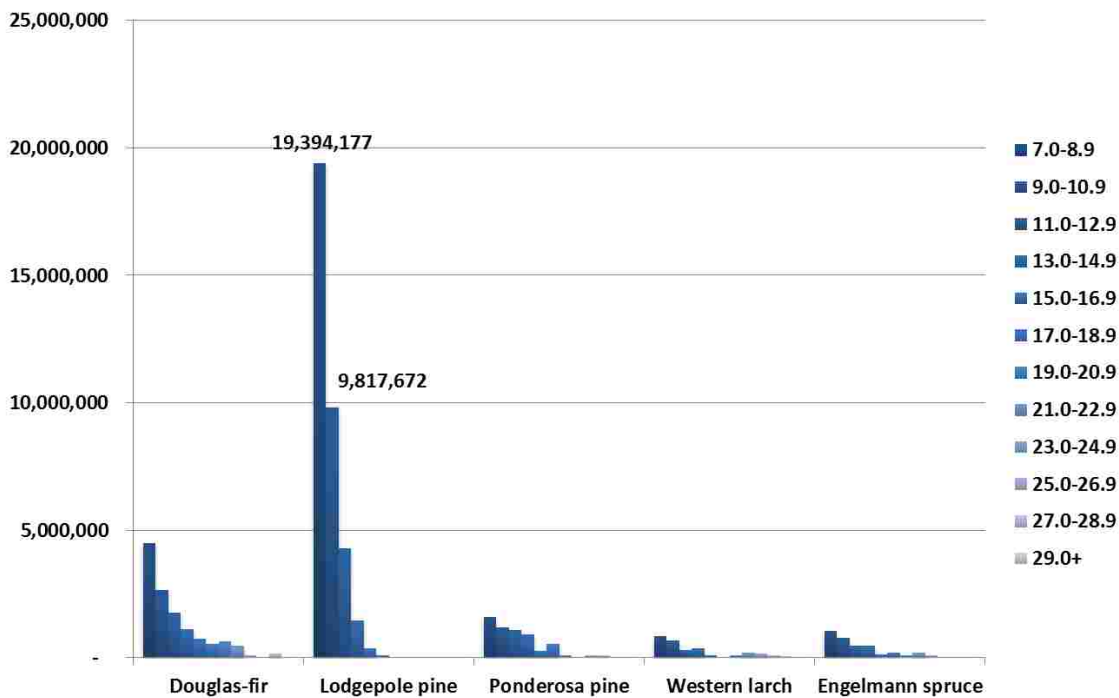
Source: IW-FIA (2009).

The most likely cause for the lodgepole pine mortality in the small diameter classes is attacks by *Dendroctonus ponderosae* (Mountain pine beetle). After conducting aerial surveys in 2011, of approximately 20.5 million acres of forested lands, Hayes, et al. (2012), reported

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[4] Reporting the average annual mortality by species volume was the preferred choice for this report. However, due to forest inventory updates being input into the EVALIDator database by the IW-FIA at the time of this report, these mortality volumes were not available.

findings indicating that mountain pine beetles were the primary mortality agent observed in 2011, as well as 2010 and 2009. The 2011 aerial surveys revealed that 78% of the host type trees infected by mountain pine beetles were lodgepole pine, with second most preferred host being ponderosa pine at 15% of the total (Hayes, et al., 2012). The amount of mountain pine beetle infestation surveyed has declined from 22.2 million newly infected trees in 2009, to 10.9 million newly infected trees in 2010, and 3.7 million newly infected trees in 2011 (Hayes, et al., 2012). The information collected from these annual aerial surveys indicates that mountain pine beetle infestations are likely the cause of small diameter lodgepole pine trees experiencing negative net annual growth and having high numbers of standing dead trees.

In order to identify the total annual growth rates for Montana's timber species, 2009 harvest estimates were added to the IW-FIA average annual net growth estimates (which already account for average annual mortality). This is presented in Table 3.2. As can be seen in this table, the total annual growth rate of Montana's net harvestable timber is 151.2 MMCF.

Table 3.2: Montana 2009 total annual growth rates by species (MMCF)

Species	Net Annual Growth Rate	Annual Harvest Estimate	Total Annual Growth
Douglas-fir	37.6	24.8	62.5
Lodgepole pine	0.5	28.0	28.6
Ponderosa pine	11.8	12.0	23.8
Western larch	16.7	5.6	22.3
Engelman spruce	10.2	6.4	16.6
Other commercial species	-5.7	3.2	-2.5
Total	71.2	80.1	151.3

Source: IW-FIA (2009); McIver et al. (2012).

Note: IW-FIA (2009) citation is for the net annual growth rate and the McIver et al. (2012) citation is for annual harvest estimates.

3.4 Montana Sawlog Timber Harvest & Price Trends

During the last two decades there has been a change in timber harvest trends according to total volume harvested, the dominant species harvested, and the primary harvest locations. In addition, the economic recession that began in 2008 has affected saw log price trends.

3.4.1 Sawlog timber harvest trends

The total sawlog timber harvest volume in Montana in 2011 was estimated to be 85.4 MMCF (344.7 MMBF Scribner). Of this amount it was estimated that 43.1 MMCF (174.3 MMBF Scribner) of the harvest occurred on private lands and approximately 24.2 MMCF (97.8 MMBF Scribner) occurred on national forests (Morgan, et al., 2012). Montana forest industry outlook reports presented by Morgan et al. (2012), show that timber harvest amounts that occurred on private lands in 2011 represent approximately 30% of the amounts harvested between 1989 and 1991. In addition, harvest amounts on national forests in 2011 represent approximately 25% of the amounts harvested between 1989 and 1991. National harvest levels have declined dramatically since the early 1990s, which is problematic for wood product mills, because the majority of non-reserved timber exists on federal lands. While the timber harvest from private lands was able to maintain a supply of timber to the mills in Montana throughout the 1990s and the first half of the last decade, these levels have declined during the last few years due to low demand levels caused by the national recession and U.S. housing collapse beginning in 2008. Montana's timber harvest trends were previously presented in Figure 2.2. This combination of supply restriction from private and national forest lands and the recent national economic recession are the primary explanations for the decrease in Montana's wood product production (Morgan, et al., 2012; Hayes, 2011; Rawlings, 2011).

3.4.2 Timber Harvest by Species & Ownership Class

The most research conducted on Montana timber harvests trends was from a BBER Forest Industries Data Collection System (FIDACS Report), that collected 2009 data from Montana timber processors (McIver, et al., 2012). This FIDACS report supplied 2009 information on harvest volume by species, harvest locations, and harvests by ownership. The primary species that were harvested in Montana in 2009 were lodgepole pine, Douglas-fir, and ponderosa pine. This was followed by various spruce and western larch. Figure 3.10 presents a harvest volume comparison of these species. McIver et al., (2012) state that between 1988 and 1998, lodgepole pine represented approximately 25% of the total volume harvested in Montana. In 2004 this percentage dropped to 18%, but rebounded to 35% in 2009. This increase in 2009 would be expected since this species has the 2nd most abundant volume available to harvest, as

presented in Table 3.1. Since 1988, Douglas-fir has always been a primary species harvested in this state and has had a range between 27% and 38% of the total species harvested (McIver, et al., 2012). During this same time period, ponderosa pine has had a range of 12% to 19% of the total volume harvested (McIvver, et al., 2012). The range for spruce trees has consisted in a range of 6% to 8% of the total timber harvested. In 1988 western larch represented 16% of the total timber harvested in Montana. Since then the harvest percentage of western larch has decline by an average of 1.8% annually. In 2009 western larch represented 7% of the total species harvested (McIver, et al., 2012)

Figure 3.10: Montana 2009 timber harvest by species
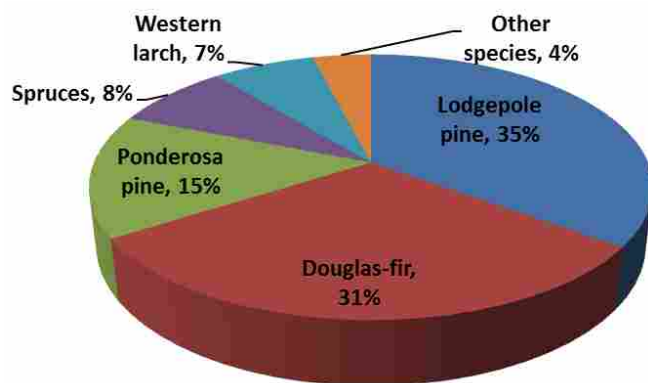
Source: McIver, et al., (2012).

The FIDACS report also identified the volumes harvested by species for each ownership class. The ownership classes reported are industrial private, non-industrial private, National Forest, other public and tribal ownership. On industrial private land the primary species harvested is Douglas-fir, which totaled 9.4 million CF in 2009. This was followed by lodgepole pine, ponderosa pine, western larch, and then spruce. Non-industrial private owners primarily harvested lodgepole pine, which totaled 11.8 million CF in 2009. This was followed by Douglas-fir and ponderosa pine. McIver et al., (2012) stated that National Forests saw harvests that were dominated by Douglas-fir, which totaled 8.9 million CF in 2009. This was followed by lodgepole pine and ponderosa pine. Harvests on other public lands were dominated by lodgepole pine, which totaled 7.5 million CF. This was followed by Douglas-fir and ponderosa pine. Harvests on tribal land in 2009 were minimal when compared to the volumes harvested by the

other ownership classes. These harvest volumes by ownership class and species are presented in Figure 3.11.

Figure 3.11: Montana 2009 timber harvest by ownership class & species (Cubic feet)
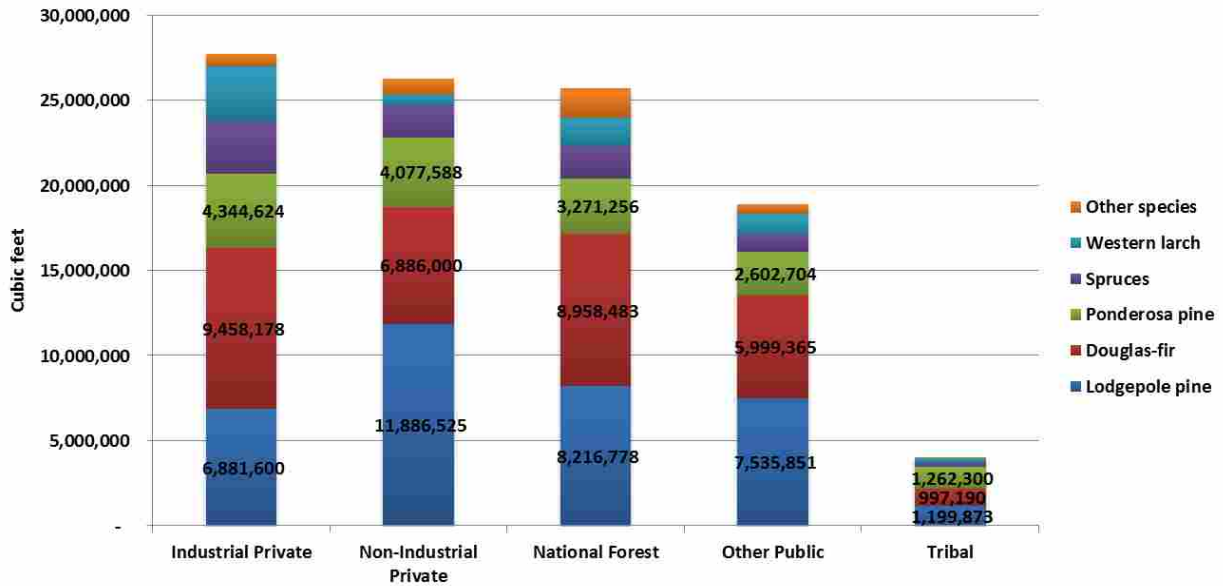
Source: McIver, et al., (2012).

3.4.3 Timber harvest by location

The FIDACS report stated that primary locations where timber harvests have occurred in Montana since 1988 is in the Flathead, Missoula, and Lincoln counties. In 1988 these three counties contributed 61% of the total timber harvested in Montana. In 2009 these three counties contributed 48% of the total. During this time the average annual contribution has been 53%. The only major change has been that the share of timber harvests in Lincoln County has declined by more than 50% since 1988. In that year, Lincoln provided 26% of the Montana's total harvested lumber. In 2009 this contribution was 12%. Other Montana counties that have consistently harvested timber include Powel, Sanders, Lake, Lewis & Clark, Mineral, and Ravalli counties. Flathead County was the primary harvest location for USFS, state, and industrial private ownerships. Missoula County was the primary harvest locations for non-industrial private ownership. BLM harvest primarily took place in Granite County. A chart containing the top fifteen Montana counties for 2010 harvests is presented in Figure 3.12.

Figure 3.12: 2010 top fifteen harvest counties by volume and ownership class (Cubic feet)
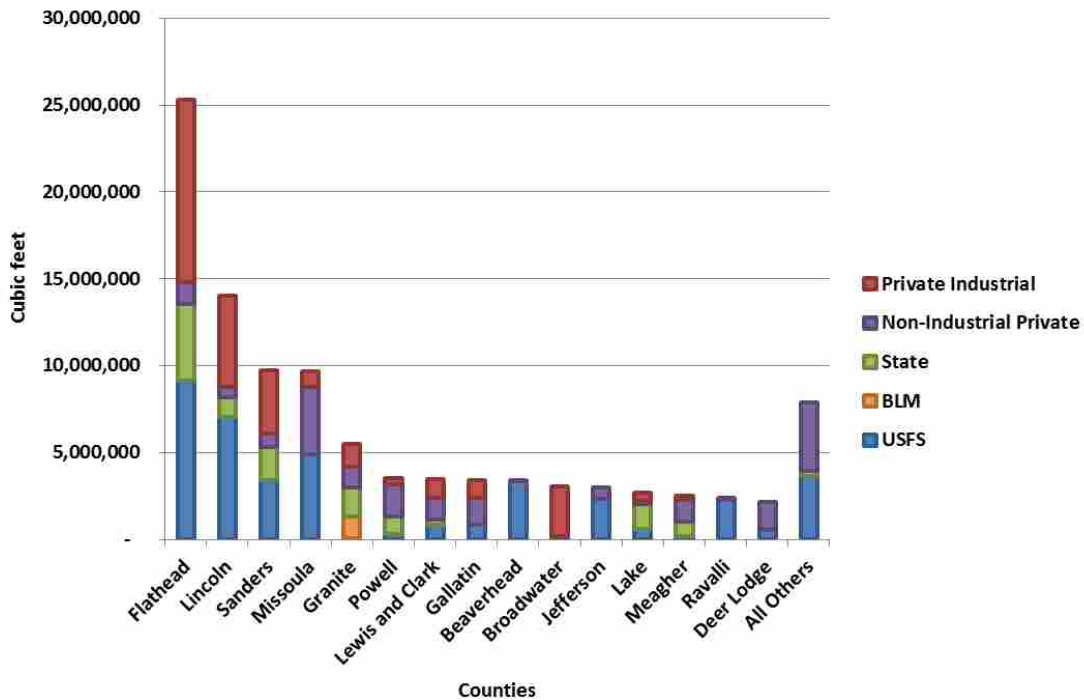
Source: Gale, et al., (2012).

3.4.4 Sawlog price trends

In order to examine the price trends for Montana saw logs, quarterly price points were collected from the BBER website for all available quarters for the years 2007 through 2012 and represent the average price points for mill delivered saw logs[5]. These price points provide a visual description of how current demand for saw logs compares with pre-recession demand and are presented in Figure 3.13.

The price trends for saw logs during the last fifteen quarters present large fluctuations caused by the 2008 recession with price volatility the highest during 2009. Price volatility was assessed by calculating the standard deviation for the price of each species from Q1 of 2007 to Q3 of 2012. Ponderosa pine (Yellow) had the highest relative price volatility at 0.33. Lodgepole pine, Douglas-fir, western larch, and Engelmann spruce all had a price volatility range of 0.25 to 0.26. Ponderosa pine (Bull) had the lowest volatility at 0.22. With the exception of ponderosa pine, the species presented are still priced below their time period average. Ponderosa pine

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[5] These price points were converted from MBF to cubic feet utilizing the methods discussed in section 1.4

(Yellow) had an average price point of $1.35 per CF, and is currently at $1.37 per CF. Ponderosa pine (Bull) had an average price point of $1.18 per CF and is currently at $1.25 per CF. The remaining species all have a current price point that is $0.07 to $0.08 below the average price point.

Figure 3.13: Western Montana Saw log Price Trends
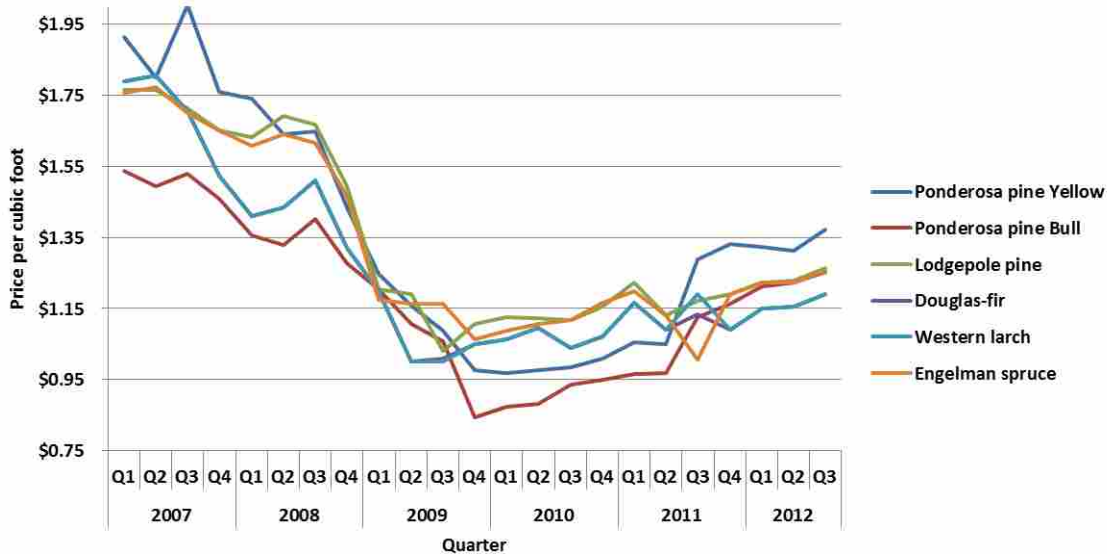
3.5 Wood Product Manufacturers

In order to gain an understanding of the wood product production capabilities of Montana, mill data was collected from RandomLengths (2012a), a national directory of forest product manufacturers. These twenty manufacturers are presented in Figure 3.14. Of the twenty manufacturers that were identified, fifteen of them were sawmills, four wood panel manufacturers, and one was a laminated beam plant. It is assumed that the majority of these twenty manufacturers represent the primary production capacity in Montana. In addition, 27 other saw mills were identified in the Montana Manufacturing Information System database (MMIS, 2012). It is unknown if some of these mills have recently closed due to economic challenges.

Figure: 3.14: Montana primary wood product manufacturers

City	Mill
Columbia Falls	Plum Creek MDF
	Plum Creek Plywood
	Plum Creek Lumber
	RBM Lumber
	F. H. Stoltze Lumber
Columbus	Timberweld Mfg.
Deer Lodge	Sun Mountain Lumber FJ
	Sun Mountain Lumber Stud
Kalispell	Klinger Lumber
	Plum Creek Plywood
	Plum Creek Lumber
Livingston	R-Y Timber
Missoula	Eagle Stud Mill
	Roseburg Forest Products
Roundup	Gebhardt Post & Lumber
Saint Regis	Tricon Lumber
Seeley Lake	Pyramid Mountain Lumber
Thompson Falls	Thompson River Lumber
Three Forks	Silver City Lumber
Townsend	R-Y Timber

Interstate
Rail

Source: RandomLengths, (2012a)

Of the fifteen sawmills identified in the RandomLengths (2012a), catalog, eleven of them included their 8-hour cubic foot mill capacity. These mill capacities are presented Figure 3.15. For four of these mills, the cubic foot mill capacity was not provided. Two of them are owned by Plum Creek NW Lumber and are located in Columbia Falls and Kalispell. Anecdotal evidence suggests that these two Plum Creek mills were at the higher end of production capacity levels. The third lumber mill is Tricon Timber LLC, and is located in St. Regis. The fourth lumber mill is owned by Klinger Lumber Company and is located in Kalispell. The eight hour cubic foot capacity of these two mills is not known. Four panel mills were identified by (RandomLengths,2012a), which are presented in Figure 3.16 and ordered by their cubic foot capacity level on an 8 hour basis.

Figure 3.15: Montana sawmill 8-hour capacity comparison in cubic feet
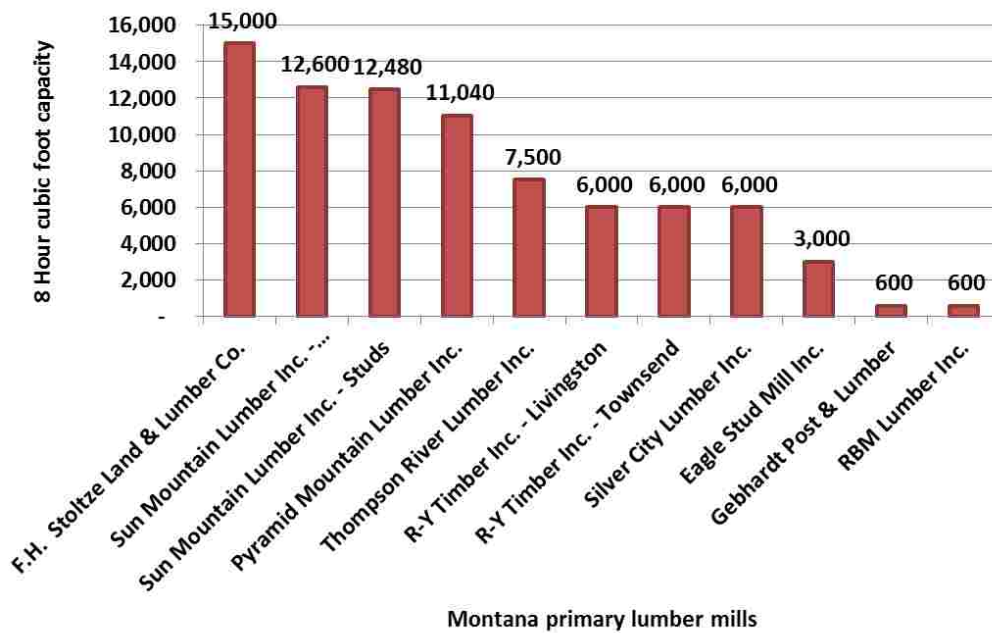
Source: RandomLengths, (2012a).

Figure 3.16: Montana panel production 8-hour capacity comparison in cubic feet
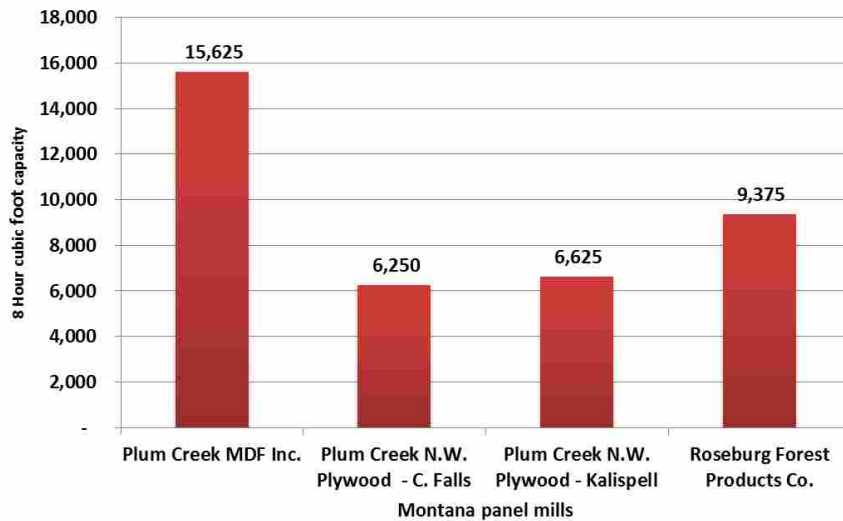
Source: RandomLengths, (2012a).

While the RandomLengths (2012a) directory was able to provide capacity levels of eleven sawmills and four panel mills, this information only provided eight-hour mill capacities and did not include many of the additional mills in Montana. To gain a further understanding of Montana's wood production capabilities, annual production capacities were collected for the 2009 FIDACS report produced by McIver et al., (2012). While this report was able to provide production capacity estimates for all known Montana lumber mills in 2009, it was not able to distinguish between individual mills due to confidentiality agreements. This FIDACS report found that in 2009 there were 5 Montana sawmills that were capable of producing more than 12.3 MMCF of lumber on an annual basis. These mills represented 62.9% of the total lumber production and had an average individual production of 13.9 MMCF annually. Six Montana sawmills were identified that were capable of producing between 2.5 MMCF and 12.3 MMCF of lumber on an annual basis. These mills represented 34.6% of the total lumber production and had an average individual production of 6.4 MMCF annually. In 2009, there were three Montana mills that were capable of producing 247.6 thousand CF to 2.5 MMCF on an annual basis. These mills represented 0.9% of the total production and had an average individual production of 346.7 thousand CF annually. Montana sawmills in 2009 that were in the production size class of less than 247.6 thousand CF totaled 27. These mills represented 1.6% of the total lumber produced and had an average individual production volume of 64.3 thousand CF. The total production

capacity of the Montana sawmills in 2009 was estimated to be 127.9 MMCF. Of this capacity, only 47% was utilized, resulting in a total sawmill volume processed of 60 MMCF.

According to data presented in the MMIS (2012) database, of the other types of wood products produced in Montana, log homes present greatest percentage of the total, followed by cabinets and countertops, and furniture. It is unknown if any of these companies have recently shut down due to economic challenges. These types of companies that produce products in the "Other products" category are presented in Table 3.3. These manufacturers are typically referred to as secondary manufacturers.

Table 3.3: Other Montana wood product manufacturers

Timber Product Sector	Companies	% of Total
Log Home	64	26%
Cabinets & Countertops	50	20%
Furniture - Primarily Wood	40	16%
Millwork - Doors	20	8%
Specialty Wood Products (Crafts)	17	7%
Post & Pole	14	6%
Engineered Wood Products	14	6%
Log Furniture	7	3%
Pallets, Stakes, Containers	5	2%
Bark	3	1%
Pellets	3	1%
Wood Signs	3	1%
Prefabricated Buildings	2	1%
Pulp & Paper Products	2	1%
Cedar Products	2	1%
Fuelwood	2	1%
Sporting Goods (Gun Stocks, Bows)	2	1%
Total	250	100%

Source: MMIS (2012).

3.6 Wood Product Production

McIver et al., (2012) reported that lodgepole pine, Douglas-fir, and ponderosa pine are the primary species utilized for saw and veneer logs.   As can be seen in Table 3.4, lodgepole pine was the primary species utilized for saw logs, house logs, and other products. This presents a change from 2004, where Douglas-fir was the primary species utilized for saw logs, followed by ponderosa pine (Spolema et al., 2008). It is also evident in Table 3.4 that sawmill products present the majority of 2009 wood product production in Montana at 58.5%, followed by "Other products" at 35.9%. Approximately 84% of the "Other products" amount was utilized for pulp

and paper products (McIver et al., 2012). However, with the recent closure of the Smurfit-Stone pulp mill it is expected that proportion of harvested timber to the "Other products" category has largely decreased and in turn raised the proportion of saw logs.

Table 3.4: Timber Utilization by Species & Product in Montana 2009 (MMCF)

Row Labels	Sawlogs	Veneer Logs	House Logs	Other Products	Total	% of Total
Lodgepole pine	22.5	-	0.2	16.1	38.8	37.8%
Douglas-Fir	16.7	3.4	0.0	10.2	30.4	29.6%
Ponderosa pine	9.7	-	0.0	5.8	15.5	15.1%
Engelman spruce	5.5	-	0.1	2.1	7.7	7.5%
Western larch	2.4	1.8	0.0	2.0	6.2	6.1%
Other	3.3	-	-	0.7	4.0	3.9%
Total	60.1	5.3	0.5	36.9	102.7	100%
% of Total	58.5%	5.1%	0.4%	35.9%	100%	

Source: McIver, et al., (2012).

The four primary types of lumber products manufactured are dimensional lumber, boards, timber, and factory/industrial. Dimensional lumber mainly refers to lumber with a nominal thickness of two inches. Boards mainly refer to lumber with a nominal thickness of one inch. Timbers have a nominal thickness of five inches and greater. Factory/industrial refers to lumber cut up to make products such as doors, window parts, mouldings, and furniture (Leckey, 2007). Spolema, et al. (2008), concluded that 77% of the lumber produced in Montana is dimensional lumber, with boards, timbers, and factory/industrial products making up the remainder. A detailed description of lumber and panel products is presented in Appendix A.

3.7 Sustainable Certifications

Sustainable certifications can be an advantage for manufacturers because sustainably certified products can obtain a price premium in some markets. This is possible because there are some customers that are willing to pay a higher price for wood products if they know that they were produced in a sustainable manner. Forest certification is method that ensures that forests and wood products are managed and produced in a sustainable manner. These systems are voluntary and verification in generally administered by an independent third party. In the U.S. there are four primary certification systems, which include The American Tree Farm

system, the Sustainable Forest Initiative (SFI), and the Forest Stewardship Council (FSC), and the Program for the Endorsement of Forest Certification (PEFC). It was found that there are four wood product manufacturers in Montana that are sustainably certified.

All of Plum Creek's timber land is certified under SFI. The third party verification is performed by Bureau Veritas (PlumCreek, 2012). Pyramid Mountain Lumber in Seeley Lake, Montana is also an SFI certified company (Pyramid, 2012). All of the timber land managed by F.H.Stoltze near Columbia Falls, MT has been certified under the American Tree Farm System since 1963 (Stoltze, 2012). According to the Roseburg Forest Products website, all of their UltraBlend particle board fiber is third party certified and meets the California Air Resources Board's (CARB) standards for formaldehyde emissions (Roseburg, 2012). A detailed description of these certifications is presented in Appendix B.

3.8 Montana Wood Product Market Outreach

In order to gain an understanding of the market outreach for Montana's wood products, trade flow data collected for the report prepared by McIver et al., (2012). The products presented for these trade flows include lumber, veneer products, house logs, and other finished products. The market outreach for Montana wood products is presented in Figure 3.17. Of the exports presented in this figure, approximately 94% of the volume was shipped to Canada and just over 5% was shipped to Mexico. Less than 1% was shipped to Asia and other countries in South America (FAF, 2011).

Figure 3.17: Regional comparison of 2009 Montana wood product shipments by value

2009 Proportion of MT Wood Product Sales	
North Central	27%
Far West	18%
South	13%
Montana	12%
Rocky Mountains	11%
Exports	10%
North East	8%
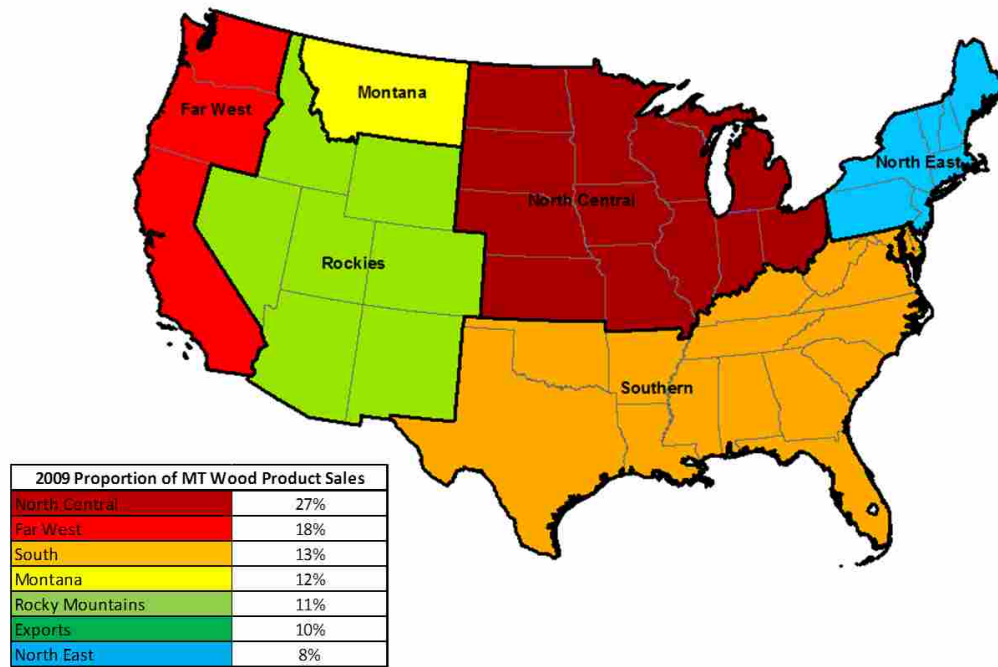
Source: McIver et al., (2012).

Note: The far west region includes Alaska and Hawaii.

3.9 Montana Wood Product Distribution Capabilities

In order to gain an understanding of the distribution capabilities utilized by Montana wood product manufacturers, 2010 shipment data was collected from the Department of Transportation's Freight Analysis Framework data tabulation tool (FAF, 2011). This data is presented in Figure 3.18 and provides a comparison of the wood product shipment methods utilized with regional destinations. The same regional zones are utilized for both Figure 3.17 and Figure 3.18. Truck shipments were the dominate method for Montana wood product trade flows in 2010 and represent 70% of the total. This was followed by rail at 16%, multiple modes at 11% and other methods at 2%. Multiple modes refer to a combination of truck and rail, where containers are transported by truck to a rail carrier and then transferred to a train (FAF, 2011). In 2010, the truck capacity utilized for shipping wood products totaled 2,628 tons. This was followed by rail at 613 tons, multiple modes at 426 tons, and other methods at 73 tons (FAF, 2011).

Figure 3.18: Montana 2010 wood product trade flows by transportation type
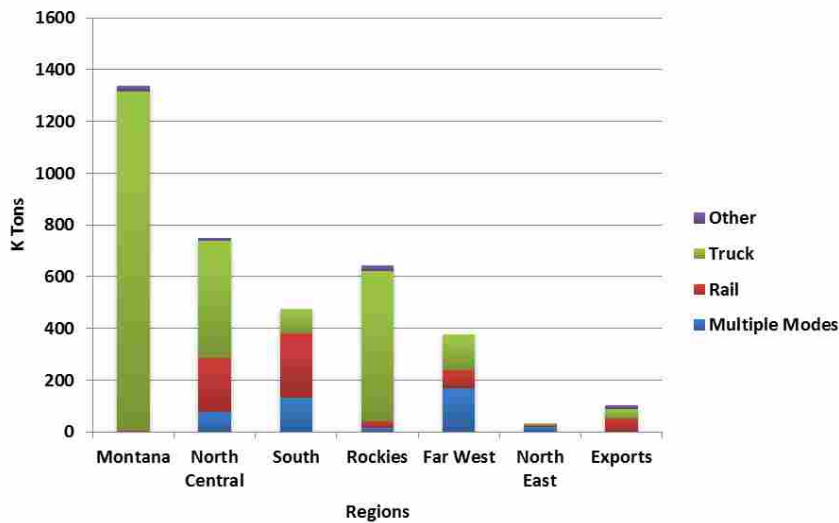
The two types of truck transportation utilized for lumber products are flatbed trucks and truck vans. The weight capacity range for these types of trucks is 21.5 tons to 25 tons[6]. The cubic feet per ton will depend on the species and lumber type. The advantages of shipping by truck when compared to rail is speed, accessibility, price for shorter hauls less than 1,000 miles, and ease of loading for flatbed trucks. The disadvantages are price for hauls over 1,000 miles, the possibility of negligent truck drivers, and tarping problems (Leckey, 2007).

The three types of rail cars that are utilized for lumber transportation are boxcars, bulkhead flat cars, and center beam flatcars. Center-beam rail cars are the primary cars used for shipping dimensional lumber products from the intermountain region to the Seattle/Tacoma ports. MRL rents these cars from BNSF, who has over 1,600 center-beam cars in storage waiting for increased demand (Lewis, 2012). It is standard practice for most Montana mills to provide their products FOB to the rail car, as long as they are located on a rail line. Center beam flatcars have a solid divider running down the length of the car. The holding capacity for a 73'4" center beam car is approximately 100 tons. According to Leckey (2007), this translates to a capacity range of 5.5 thousand CF to 7 thousand CF of dimensional lumber per center beam car. The advantages of shipping by rail when compared to truck are cheaper costs when exceeding 1,000 to 1,500 miles, greater efficiency with large loads, and ease of loading on flat cars. The

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[6] This conversion was from pounds to short tons, and utilized a conversion factor of 0.0005 tons per pound

disadvantages are slow speeds and the supplier and buyer need to be located near a rail siding (Leckey, 2007). An in depth description of the various transportation options for shipping wood products is available in Appendix C.

3.10 Montana Forest Industry Competencies and Summary

       The third objective of this chapter was to determine the core competencies of Montana's forest industry. From the findings in this chapter, the core competencies have been identified in terms of timber resource supply, primary manufacturing capabilities, and distribution strength. The greatest amount of potential net harvestable forest volume is primarily from Douglas-fir, lodgepole pine, and ponderosa pine tree species, followed by western larch and Engelmann spruce. The strength of this supply is primarily in the small diameter size classes (7.0"-14.9"), which represents approximately 70% of the total net harvestable volume. The potentially available lodgepole pine trees are predominantly located on National Forest land, with Douglas-fir and ponderosa pine trees being more evenly split between National Forest land and private land ownership. Lodgepole pine is presented with low growth rates in comparison to its total volume, with bark beetle mortality being expected as the primary cause. The total annual growth rate of these five primary species is approximately 153.7 MMCF, which accounts for average annual timber mortality. The net annual growth rate these five primary species minus annual timber harvests is approximately 76.9 MMCF. These supply strengths are presented in Table 3.5.

       The primary manufacturing capabilities for Montana's forest industry exists in milled lumber. The eleven largest sawmills are responsible for 97.5% of Montana's total lumber production (McIver, et al., 2012). In 2009, it was reported that the volume of timber that was utilized for saw log products was 60 MMCF and that the volume of lumber produced from this timber was 24.9 MMCF (McIver et al., 2012; Morgan & Keegan, 2010). These inputs and outputs represent a recovery factor of 41.43%. Based on this factor and the reported 2011 lumber production volume of 31.9 MMCF, it is estimated that the 2011 saw log volume inputs were 71.6 MMCF. The total potential capacity input for these mills is 127.9 MMCF. In addition, four of the sawmill companies are sustainably certified, which can increase the value of products sold. These primary manufacturing strengths are presented in Table 3.6.

Distribution trade flows to the "Far west" region were identified in order to assess the potential shipping capacity volume to west coast ocean ports for shipping lumber to China. Distribution volume to this region was estimated to be 2.8 million CF and was distributed between multiple mode, truck, and rail shipping. It is not known what additional shipment volumes are available for multiple mode and trucks, but it was found that there are 1,600 BNSF center-beam rail cars in storage waiting for increased demand. The shipment capacity volume per car is estimated to be between 5,520 and 7,080 CF (Lewis, 2012). The estimated distribution capacity strength for shipping lumber to west coast port is presented in Table 3.7.

Table 3.5: Timber resource supply strengths based on FIA 2009 data (MMCF)

Species	Total Net Harvestable Volume	Total Annual Growth (Minus Mortality)	Net Annual Growth (Minus Mortality & Harvest)
Douglas-fir	909.6	62.5	37.6
Lodgepole pine	795.6	28.6	0.5
Ponderosa pine	637.0	23.8	11.8
Western larch	338.6	22.3	16.7
Engelman spruce	283.5	16.6	10.2
Other commercial species	250.2	(2.5)	(5.7)
Total	3,214.5	151.3	71.2

Source: IW-FIA, (2009).

Table 3.6: Montana Sawmill Capacities (MMCF)

Sawmill Capacity Description	MMCF
Total Sawmill Capacity (Timber Input)	127.9
2011 Sawmill Capacity Utilized (Timber Input)	71.6
Additional Sawmill Capcity Available (Timber Input)	56.3
Additional Lumber Production Available (Lumber Output)	23.3

Source: McIver et al., (2012); Morgan et al., (2012).

Table 3.7: Estimated potential shipping capacity to west coast ports

Shipping Method	MMCF
2010 Truck	1.08
2010 Multiple Mode	1.31
2010 Rail	0.54
Additional Rail Available	10.08
Estimated Total Potential	13.01

Source: Leckey, (2007); FAF, (2011).

By comparing the additional lumber manufacturing capacity available and the additional rail volume available, it appears that distribution capabilities are the limiting factor for determining the potential volume of lumber that could be exported to China. However, the additional rail volume available of 10 MMCF refers to volume capacity of center beam rail cars in storage. What is not known is how many times this rail volume could be used annually. If this additional rail volume was used more than 2.3 times annually, the manufacturing capacity would become the limiting factor. By utilizing the additional available manufacturing capacity of 23.3 MMCF and assuming a recovery rate of 41.4%, the potential timber harvest volume that could be processed and exported to China annually is 56.3 MMCF. The total annual growth rate for the potential net harvestable of Montana's top five trees species is 76.9 MMCF. This indicates that Montana's forest industry is capable of harvesting, processing, and shipping a volume of timber that is greater than the annual growth rate volume for these species and size classes. This signifies that a focus on maximizing the current available manufacturing capacity to produce dimensional lumber from these size classes of timber could be sustainable in terms of timber resource supply and distribution capabilities. Based on these findings, it is believed that Montana's forest industries core competencies exist in dimensional lumber production from Douglas-fir, lodgepole pine, ponderosa pine, western larch, and Engelmann spruce species.

Chapter 4

Economic Analysis of China's Wood Product Import Market
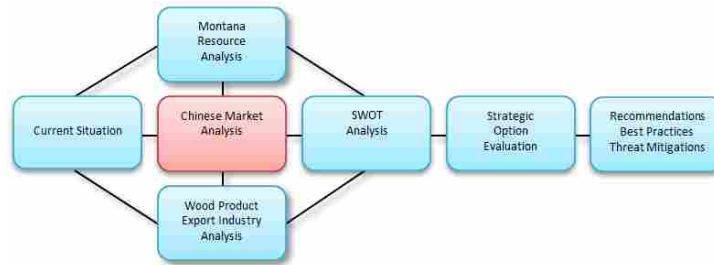
4.1 Chapter Objectives

The goal of this chapter is to provide a market economic analysis of the Chinese wood product import market, because it will allow for Montana manufacturers to be able to capitalize on opportunities and anticipate potential future changes. Changes in an industry environment are driven by economic, political, and socio-cultural factors (De Kluyver, 2000). Understanding how these factors affect China's wood product import market is essential for being able to capitalize on potential opportunities. The five chapter objectives are to present a description of China's forestland and timber supply deficit for softwood logs and lumber, identify the dominant suppliers for softwood log and lumber imports, describe China's wood processing capabilities, identify China's most prominent softwood lumber import trends by product type and use, and describe the distribution channels for wood products in China. A completion of these objectives will assist in identifying the opportunities for Montana wood product manufacturers.

4.2 Structure of China's Forestland & Timber Supply Deficit

At one time, the majority of China's land mass was dominated by forests. These forests were separated into five forest zones, which included boreal forest in the northeast, temperate forest in the north, subtropical forests in the central and southwestern regions, and tropical forests in the south. The western region of the country has historically been dominated by grasslands and desert (Marks, 2012). Drastic changes in China's forest land cover have occurred over the last four thousand years with progressive deforestation. The cause of deforestation began with the development of large-scale agricultural production and grew to include the

economic needs for natural resources and clearing space for the spread of urban development. During the Mao leadership era, continuous deforestation and ineffective afforestation left China with a seriously depleted resource base (Marks, 2012).

In 2009, China's forested land covered approximately 181.4 million hectares. Of this amount, natural forest represented 119.69 million hectares and had a stocking volume of 402,662 MMCF. Plantation forests totaled 61.7 million hectares and had a stocking volume of 69,253 MMCF. The average natural forest stocking volume was 3,483 CF per hectare and the average plantation stocking volume was 1,731 CF per hectare (Petry & Lei, 2009). Out of a commitment to improving its forest land coverage, China passed the Natural Forest Protection Program (NFPP) in 1998, which placed 108 million hectares of forest lands under protection (Hongqiang, et al., 2010). As a result of this increased forest land protection, plantation forests have seen a large amount of growth in the recent years. In 2009, 6.3 million hectares of land was planted, which was an 18% increase from the amount of hectares planted the year before (Petry, Lei, & Zhang, 2010). The growth in plantation forests is also seen as a result of China's forest property rights reform, which was designed to stimulate farmers to plant and manage trees by giving them the property rights to trees on the contracted land (Petry, et al., 2010).

Quercus (Oak) tree species dominate the stocking volume in Chinese forests, followed by *Picea* (Spruce), *Larix* (Larch), and *Betula* (Birch) tree species (Petry & Lei, 2009). This distribution is present in Figure 4.1. The stocking volume for Chinese forests seems to be dominated by young to middle age class trees, which make up 40% of the total volume. (Petry & Lei, 2009). Five major forest belts have been identified that represent approximately 85% of China's forested land. The province location, estimated area, and estimated stocking volume of these five forest belts in presented in Table 4.1. A map of the 5 Chinese forest belts is presented in Figure 4.2.

Figure 4.1: Cubic foot stocking comparison of Chinese tree species
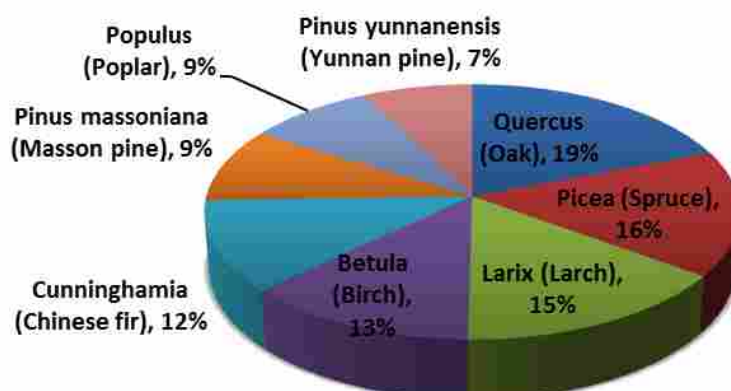
Source: Petry & Lei, (2009).

Table 4.1: Comparison of 5 Chinese Forest Belts by Region, Hectares, and Stocking Volume

Region	Provinces	Hectares (Millions)	Stocking Volume (Million Cubic Feet)
Northeast	Heilongjiang, Jilin, Inner Mongolia	36	113,467
Northwest	Xinjiang, Gansu, Shaanxi	5	18,752
Southwest	Yunnan, Sichuan, Tibet	43	179,753
Southeast	Jiangxi, Fujian, Zhejiang, Anhui, Hubei, Hunan, Guangdong, Guangxi, Guizhou, Sichuan, Chongqing, Shaanxi	58	90,583
Southern	Yunnan, Guangxi, Guangdong, Haninan, Tibet	12	30,477

Source: Petry & Lei, (2009).

Figure 4.2: Map of China's 5 forest belts
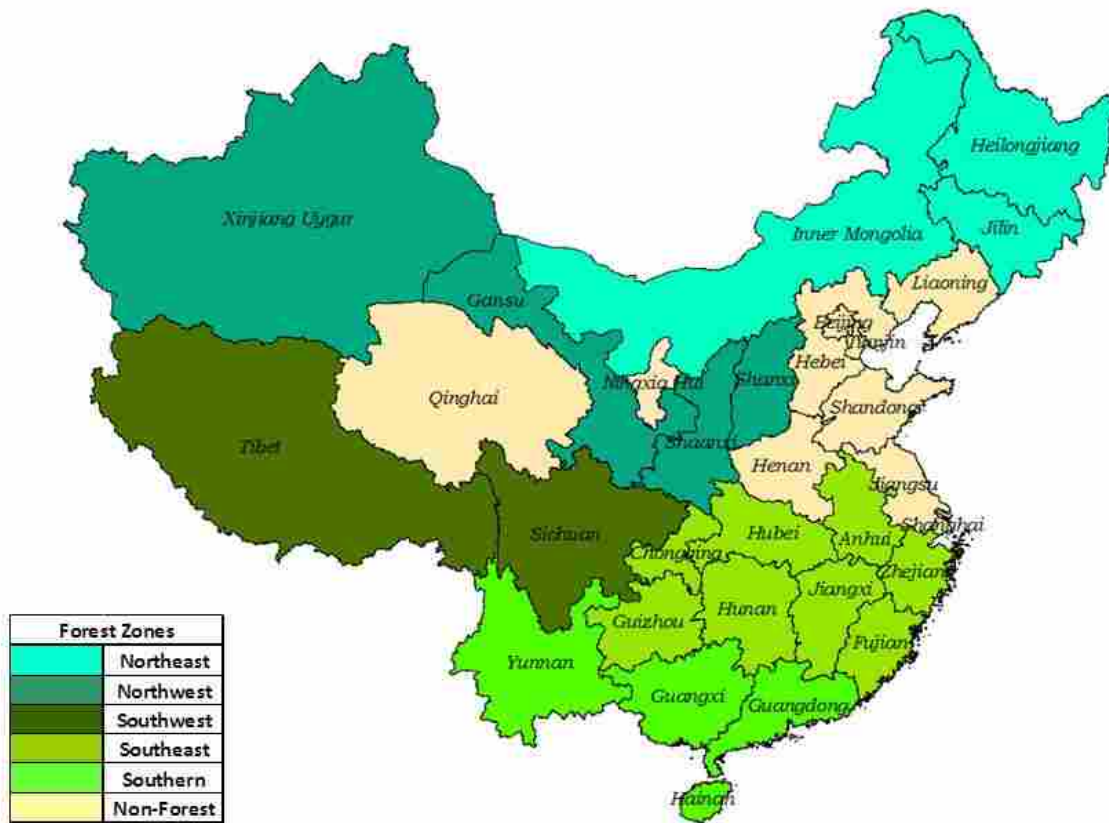
Source: Petry & Lei, (2009).

It is believed that China's forest resources are inadequate when compared to the country demands. In 2009, of the 181.4 million forested hectares, just 64.2 million hectares were managed for the production of wood and paper products (Petry & Lei, 2009). This is due to there being minimal lands suitable for expanding forested areas, ongoing forest conservation goals, and expanding agricultural production. Of the 44 million hectares suitable for future afforestation in China, poor quality sites represent 52% of the total and 60% of the sites are located in Inner Mongolia and the northwestern region of the country, which is a large distance away from manufacturing centers (Petry & Lei, 2009).

China's per capita forestland area is less than 25% of the world average and the per capita stocking volume is approximately just 14% of the world average (Petry & Lei, 2009). This

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indicates that the total volume of Chinese timber is inadequate for meeting the forest product needs of the Chinese population and has resulted in a timber supply deficit.

This timber supply deficit is evident when analyzing China's 2010 domestic consumption of softwood logs. In 2010, China produced 720.4 MMCF of softwood logs and consumed 1.5 billion CF, with the additional demand being met by imports. From the total volume of softwood logs consumed, 480.2 MMCF of softwood lumber was produced (Petry, et al., 2010). It is believed that a majority portion of the difference between softwood logs consumed and softwood lumber produced was lost as mill waste. The remaining difference was likely utilized for other wood products such as plywood, MDF, and pulp products. According to international timber analysts, China's total timber supply deficit grew by 16% annually between 1997 and 2010 (Flynn, 2011).

The past deforestation that has taken place in China has consumed a large portion of China's forest resources. Recently implemented forest protection policies have further restricted the volume of timber that is available for domestic production. The result has been a timber supply deficit of softwood logs. If China's demand of softwood wood products stays the same or grows in the future, it will be necessary for the continuation of softwood log and/or softwood lumber imports.

4.3 Analysis of China's Softwood Log Imports & Suppliers

In 2011, China was the leading country in Asia for softwood log imports which totaled just less than 1 billion cubic feet (Flynn, 2011). Russia was the primary supplier of softwood logs to China, representing 43% of the total, followed by New Zealand at 26% and the U.S. at 15% (Flynn, 2011). A recent change in Russia's softwood log export tax structure created an opportunity that has allowed other countries to take a portion of Russia's softwood log market share in China. On April 1, 2008 Russia introduced an export tax of 25% on softwood logs in order to encourage more value-added wood product production (IFI, 2012). It is estimated that 70% of Russia's total log exports are still being shipped to China (IFI, 2012). In response to this export tax, many Chinese companies have established small-scale sawmills inside Russia in order to create rough cut lumber and avoid the export tax (IFI, 2012). It is believed that the total volume of softwood being shipped from Russia to China has not changed, but the distribution

balance between logs and lumber has become more balanced instead of a majority focus on logs (Brindley, 2012).

The U.S. has been one of the countries that have capitalized on the opportunity created by the Russian softwood log export tax. According to export data collected by the U.S. Census Bureau, the average annual growth rate between 2007 and 2011 of U.S. log exports to China was 60% (USDC, 2012). This can be seen if Figure 4.3. The total value of the 2011 log exports from the U.S. under NAICS Code 113310 was $1.09 billion. Industry analysts have determined that during the last few years the Chinese import proportion of logs to lumber has grown in favor of lumber. It is believed that the cause of this trend is primary attributed to Russia's softwood log export tax and that large volumes of low-cost lumber that is being imported from Canada (Brindley, 2012).

Figure 4.3: Value of U.S. exports of logs to China
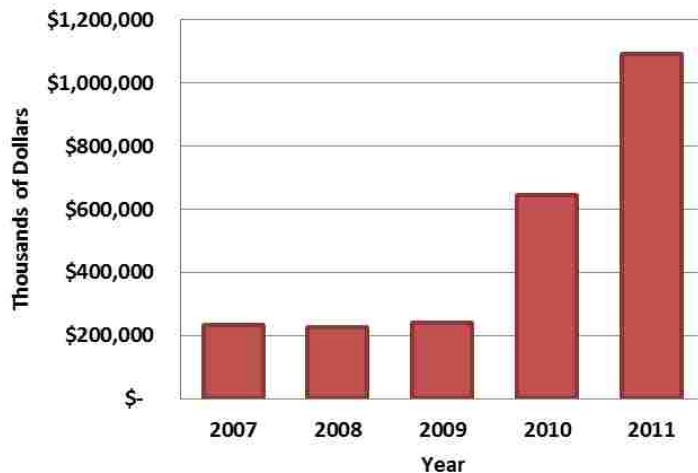
Source: USDC, (2012).

4.4 China's Wood Product Manufacturing Capabilities

A Chinese forest products report prepared by Petry, et al., (2010) revealed that there are approximately 140,000 wood processing centers in China. Of these, 80% of them are privately owned. The majority of them are located in eastern and southeastern China, with Guangdong Province being the largest wood manufacturing region. As was previously stated, China's 2010 softwood lumber production was estimated to be 480.2 MMCF. The majority of China's

sawmills are located in close proximity to their timber resources. The northern provinces that are known to have mills include Hebei, Shandong, Heilongjiang, and inner Mongolia. The southern provinces that are known to contain sawmills include Jiangsu, Zhejiang, Guangdong, and Fujian (Cao, et al., 2006).

Petry, et al., (2010) stated that China is the world's largest consumer of wood panel products and it was estimated that China's wood panel based production produced 3,355 million cubic feet of panel products in 2009. The majority of this production occurred in eastern China with Jiangsu, Henan, Shandong, Hebei, Guangxi, Fujian, Anhui, and the Guangdong provinces accounting for over 75% of total production. A trend identified by Petry, et al., (2010), is that furniture manufacturers are switching from plywood to particle board and fiber board due to reduced costs. In 2009, fiberboard and particle board accounted for over 60% of the furniture industry's panel consumption in the Guangdong Province. The primary furniture manufacturing centers are located in Guangdong, Zhejiang, and Fujian provinces. Petry, et al., (2010) also recognized that there new furniture manufacturing centers have recently been established in the Jiangxi, Anhui, Chengdu, and Sichuan provinces. The Chengdu and Sichuan provinces alone have over 3,000 furniture manufacturers, with a total output value of U.S. $5 billion in 2009. These new centers are primarily focused on producing middle to low end furniture products. China's wood panel production for 2009 is presented in Table 4.2.

Table 4.2: China's 2009 wood panel production

Product Category	Cubic Feet	% Increase from 2008
Plywood	1,571,870,650	26%
Fiberboard	1,232,140,350	14%
Particleboard	505,357,650	25%

Source: Petry, et al., (2010).

In contrast with furniture, flooring products have no market in the rural regions of China and primarily rely on middle class housing developments in large eastern cities. Zhejiang province accounts for over 19% of the wood flooring production and is the largest wood flooring producer in China. Inner Mongolia has recently emerged as a new wood processing center, with some of the new manufacturers including Xin Floors, Nature Floors, Lacquer Craft, and Ikea (Petry, et al., 2010). China's flooring production in 2009 is presented in Table 4.3.

Table 4.3: China's 2009 wood flooring production

Flooring Category	Square Feet	% Change from 2008
Laminated	1,362,392,240	10%
Engineered	1,261,144,940	49%
Solid Wood	872,012,460	-34%
Bamboo	215,458,540	47%

Source: Petry, et al., (2010).

4.5 Analysis of China's Softwood Lumber Imports & Suppliers

In 2011, China was the leading country in Asia for lumber imports. Statistics presented by the British Columbia Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO, 2012), suggests that China's total lumber import volumes in 2011 were 759.2 MMCF, which is an increase of 46.3% from 2010. The estimated value of these imports was $5 billion. In 2011, the leading supplier of softwood lumber to China was Canada, which supplied 45% of China's imports, followed by Russia at 36% (Flynn, 2011). This country supplier comparison can be seen in Figure 4.4. In regards to product type and species exports to China, Canada has primarily focused on softwood lumber that is dominated by spruce/pine/fir (SPF). Russian lumber exports to China are believed to have a large pine component (SEC, 2011). The primary export species from the U.S. in 2011 was Douglas-fir, which represented 31% of total lumber export shipments (RandomLengths, 2012b).

In 2011, it was estimated that Chinese imports of U.S softwood lumber totaled $245 million. The average annual Chinese import growth rate of softwood and treated lumber from the U.S. between 2007 and 2011 was 87%. This trend can be seen in Figure 4.5.

Figure 4.4: China's 2011 top softwood lumber suppliers by country
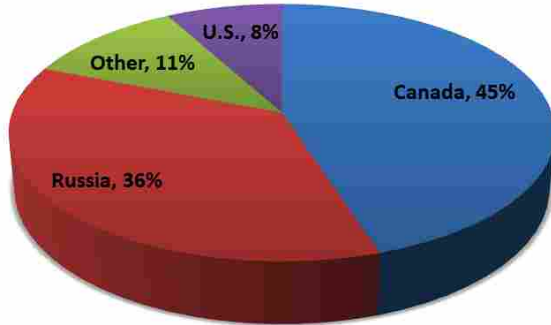
Source: Flynn, (2011).

Figure 4.5: China's softwood & treated lumber import value trend
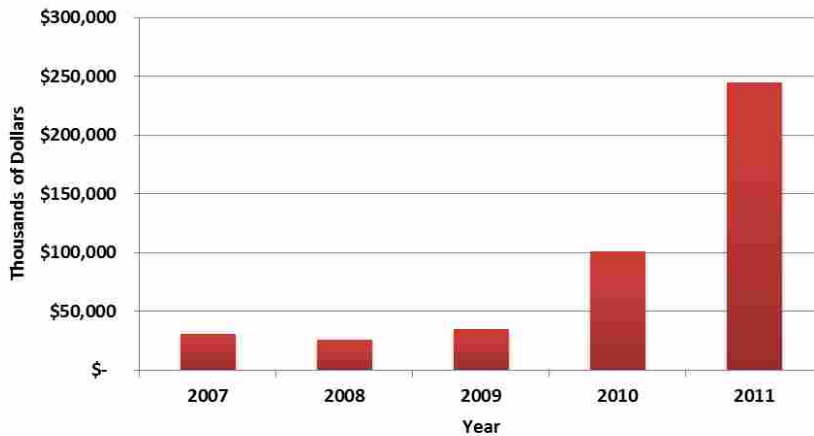
Source: SEC, (2012)

Chinese lumber import data collected by the USDA Foreign Agriculture Service (FAS), and presented by the Softwood Export Council (SEC), reveals that there are seven softwood lumber species categories that exist in the Pacific Northwest and the northern Rocky Mountains. These species categories are presented in Figure 4.6. Of the species categories presented, only Douglas-fir, ponderosa pine, and lodgepole pine exist in substantial volumes on Montana timberland.

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Figure 4.6: China's 2011 softwood lumber import values of species that grow in the Pacific Northwest & Northern Rocky Mountains (Thousands of Dollars)
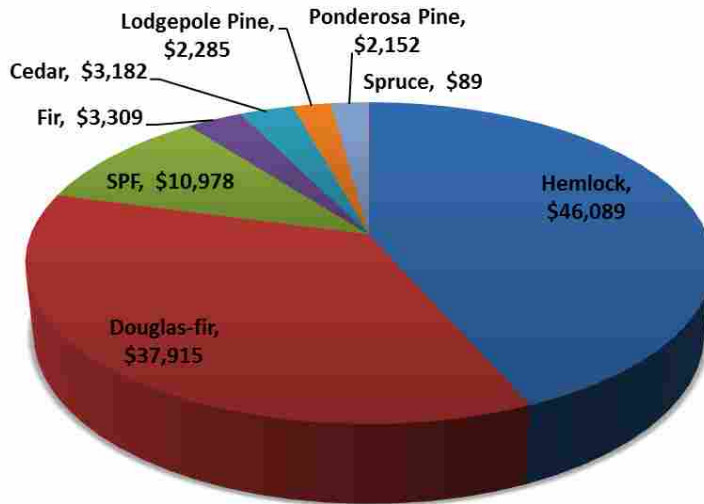
Chinese import data provided by the SEC (2012) is presented by the Schedule B Code number, the species category of the product, and the annual import value. Schedule B Codes are the U.S. government's numeric system of identifying all goods and services for export. This information for the four species that exist in Montana at substantial volumes is presented in Table 4.4. The table contains the Chinese import values of these species categories from the U.S. for 2009 to 2011 and the average annual growth rate. In some cases, species categories are presented multiple times because they represent a different product type and have a different Schedule B Code. A description of all of the Schedule B Codes utilized in this analysis is presented in Table 4.5.

Table 4.4: Schedule B Code categories of Chinese softwood lumber imports from the U.S. by 2011 value that are produced in Montana (Thousands of dollars)

Schedule B Code	Species	2009	2010	2011	Average Growth Rate
4407100157	Douglas-fir	$ 1,608	$ 10,701	$ 33,746	666%
4407100154	Douglas-fir	$ 476	$ 920	$ 2,864	167%
4407100156	Douglas-fir	$ 452	$ 785	$ 1,305	63%
4407100144	Lodgepole pine	$ -	$ 240	$ 1,478	258%
4407100145	Lodgepole pine	$ 468	$ 12	$ 807	24%
4407100149	Ponderosa pine	$ 154	$ 428	$ 502	75%
4407100148	Ponderosa pine	$ 1,215	$ 1,077	$ 1,650	12%
4407100119	Spruce	$ 11	$ -	$ 49	115%
4407100120	Spruce	$ 58	$ -	$ 40	-10%

Source: SEC, (2012).

Table 4.5: Schedule B Code descriptions

Schedulue B Code	Description
4407100157	DOUGLAS-FIR WOOD SAWN OR CHIPPED LENGTHWISE, SLICED OR PEELED, WHETHER OR NOT PLANED, OR SANDED THICKNESS OV 6MM, NOT TREATED, NESOI EX FINGER-JOINTD
4407100154	DOUGLAS-FIR WOOD SAWN OR CHIPPED LENGTHWISE, SLICED OR PEELD, THICKNESS OVER 6MM, MINIMUM DIMENSION LESS THAN 5.1CM, NT TREATD ROUGH EX FINGER-JOINTED
4407100156	DOUGLAS-FIR WOOD SAWN, CHIPPED LENGTHWISE, SLICED, PEELD, THICKNESS OVER 6MM, MINIMUM DIMENSION 12.7CM OR MORE, NOT TREATED ROUGH EXCEPT FINGER-JOINTD
4407100144	LODGEPOLE PINE WOOD SAWN OR CHIPPED LENGTHWISE, SLICED OR PEELD, WHETHER PLANED, OR SANDED OF A THICKNESS OVER 6MM, NOT TREATD ROUGH EX FINGER-JOINTED
4407100145	LODGEPOLE PINE WOOD SAWN OR CHIPPED LENGTHWISE, SLICD OR PEELED,WHETHER PLANED, SANDED, THICKNESS OVER 6MM, NOT TREATED, NESOI, EXCEPT FINGER-JOINTED
4407100149	PONDEROSA PINE WOOD SAWN OR CHIPPED LENGTHWISE, SLICED OR PEELED, WHETHER PLAND, SANDED, THICKNESS OV 6MM, NOT TREATED, NESOI, EXCEPT FINGER-JOINTED
4407100148	PONDEROSA PINE WOOD SAWN OR CHIPPED LENGTHWISE, SLICED OR PEELED, WHETHER PLANED, SANDED, THICKNESS OV 6 MM, NOT TREATD, ROUGH, EXCEPT FINGER-JOINTED
4407100119	SPRUCE NESOI WOOD SAWN/CHIPPED LENGTHWISE, SLICED OR PEELED, WHETHER OR NOT PLANED, OR SANDED THICKNESS OVER 6MM NOT TREATED ROUGH EX FINGER-JOINTED
4407100120	SPRUCE NESOI WOOD SAWN/CHIPPED LENGTHWISE, SLICED/PEELED, WHETHER OR NOT PLAND,SANDED, THICKNESS OVER 6MM, NOT TREATED, NOT ROUGH, EX FINGER-JOINTED

Source: USDC, (2012).

As can be seen in Table 4.4, the majority of Schedule B Codes represent a large amount of growth. Douglas-fir is the species category with the largest market value, followed by the ponderosa pine. In 2011, a survey was conducted by the Softwood Export Council at the Interzum Wood Product Trade Show in Guangzhou, China, which consisted of 120 Chinese trade show attendee participants (SEC, 2011). This survey revealed that the primary species of interest was Douglas-fir at 22%.

Survey data collected by the SEC and interviews with softwood export specialists revealed that price is the leading factor for Chinese purchase decisions (Braden, 2012; SEC, 2011). The other factors that are of importance to Chinese softwood lumber importers are supply availability and supply stability, with the interest of identifying a supplier that is able to produce

consistently at a long-term timeframe (SEC, 2011). The desired product types and grades are dictated by the expected product use.

4.6 Chinese Softwood Dimensional Lumber Product Use

Industry analysts have determined that approximately 85% to 90% of China's softwood lumber imports are dimensional lumber being utilized for housing construction (Brindley, 2012). The majority of China's housing is concrete multi-unit apartments. Wood frame construction was popular with traditional Chinese architecture, but now is primarily only used for luxury housing. Softwood lumber products are used for the concrete forms utilized in constructing large apartment buildings and for attaching drywall to the interior concrete walls (Braden, 2012; J. Cao, et al., 2006; Owen, 2012). The type of softwood lumber that is utilized for the construction of concrete forms is low-grade 2x4s or studs. Metric cuts and high grade quality are not necessary for these lumber pieces because the concrete forms are temporary structures (Owen, 2012). The desired lengths of these 2x4s or studs is dependent on the construction project, but softwood export specialists have noticed that there is an increased desire for 10 foot lengths (Braden, 2012). A photo representation of concrete forms is presented in Figure 4.7.

Figure 4.7: Concrete Form Construction in China

Source: Owen, (2012).

The attachment of drywall to the interior walls is also performed with 2x4s or studs. These pieces of lumber are ripped lengthwise into furring strips that have a thickness and width of 18mm and 38mm (Owen, 2012). Despite that fact that the end furring strip product is metric, it is not required that metric studs be imported, according to industry specialists (Braden, 2012; Owen, 2012). The actual English dimension of a nominal 2x4 or stud is 1 ½" by 3½". The metric dimension of a nominal 2x4 is 38mm by 89mm. By ripping a 2x4 or stud lengthwise, 4 furring strips can be created with a dimension of 18mm by 38mm while allowing for three kerf cuts of 5.6mm. This is presented in Figure 4.8. These furring strips are attached to the interior concrete floors, ceilings, and walls in a lattice framework that can be utilized to attach the drywall and flooring pieces (Owen 2012). A photo representation of this lattice framework is presented in Figures 4.9 and 4.10. Originally, Chinese softwood lumber importers were utilizing low-grade 2x4s for the construction of these furring strips. However, it has been realized that total construction costs can be lowered by purchasing higher grades of lumber, such as structural light framing #2 and #3 grades (Braden, 2012). This combination of 2x4s or studs for assembling concrete forms and constructing 18mm by 38mm furring strips is the current majority portion of softwood lumber imports into China. The growing imports of these products are being driven by China's growing real estate market.

Figure 4.8: Furring strip manufacturing from nominal 2x4s

18 mm Furring Strip
5.6mm Saw Kerf Allowance

1½" or 38mm

3½" or 89mm
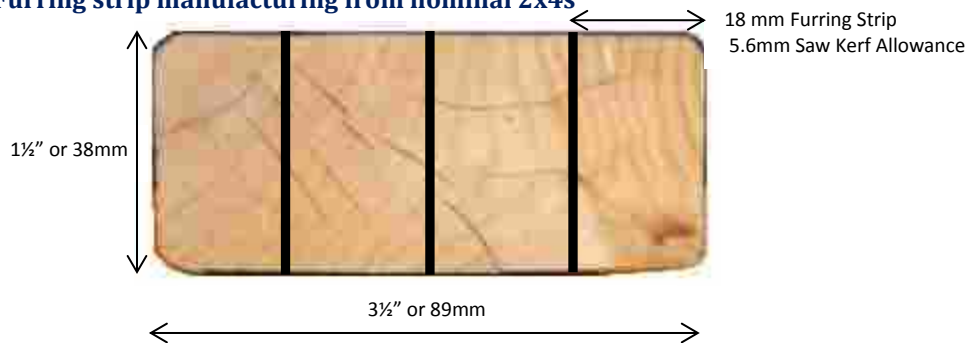
Figure 4.9: Furring strip flooring lattice Framework

Source: Owen, (2012)

Figure 4.10: Furring strip ceiling lattice Framework

Source: Owen, (2012)

4.7 Chinese Real Estate Market Analysis

There are two primary factors that have caused the large growth in softwood lumber imports used in Chinese housing construction. They are a large population with a growing middle class being driven by a strong economy, and a large level of capital investment into China's real estate market by the central government. In 2010, the total population of China was estimated to be 1.34 billion people and has had an average annual growth rate of 0.56% during the last six years (NBSC, 2012). According to the Chinese National Bureau of Statistics, the proportion of the urban population recently reached 51.27% and totaled approximately 690.8 million people. This was an increase of 21 million people from the previous year (NBSC, 2012), which demonstrates the large migration from rural regions towards urban cites that can provide jobs.

In 2010, China became the world's largest exporter and stood as the second largest economy. That year saw the country's GDP (purchasing power parity) at $10.1 trillion, with a growth rate of 10.3%. It is estimated that China's GDP is separated between 10.1% agriculture, 46.8% industry, and 43.1% services. The per capita GDP is estimated to be $7,600 USD (CIA, 2012), and it is believed that over 200 million Chinese citizens have a per capita income greater than $8,000 USD (USCS, 2011). It is expected that by 2020 there will be over 400 million households that have an annual income exceeding $9000 USD (CBH, 2011). It is estimated that

China's growing middle class is currently over 230 million people (USCS, 2011), and it is their new economic status that is creating the need for housing construction.

The large amount of capital investment into China's real estate was largely the result of housing reform policies. In 1997 the Chinese government phased in privately owned housing (Cao, et al., 2006). Prior to this point, Chinese citizens lived in small, low quality apartments that were provided to them by their employers. This change came out of the recognition that maintaining public housing would continue to be an economic burden. Citizens are now allowed to own homes and condominiums, with the Chinese government still maintaining ownership of all the land. Land leases are generally provided on a 70 year basis (Cao, et al., 2006). This sudden change in housing policy provided a new investment mechanism for China's growing middle and upper class.

After the passing of the housing reform policies, a large portion of affluent citizens bought real estate (Brindley, 2012). The reason for this includes the low perceived cost for ownership, low interest rates on real estate, high household savings rates, and a lack of alternative investment options (Ahuja, et al., 2010). Mortgage loan growth nearly reached 50% in 2009, which raised the national mortgage debt to 15% of the nominal GDP. At the end of 2009, property development loans and mortgages accounted for approximately 20% of all loans in the country. Real Estate development has become a major portion of China's economic growth and in 2009 accounted for 20% of total investment and 9% of the GDP. In 2009 land leases accounted for approximately 30% of the Chinese government's general revenue (Ahuja, et al., 2010). The proportion of households that are full or partial homeowners has grown from 17% in 1990 to 86% in 2005. According to data provided by the United Nations demographic yearbook, the largest age brackets in the urban regions of China are between 25 and 34 years, totaling 21.47%. In 2006 approximately 80% of urban residents lived in multi-family high-rise buildings (Cao, et al., 2006), which continue to be the primary units constructed (Owen, 2012).

China has the world's largest construction market and is expected to build over 50% of the world's buildings during the next decade (USCS, 2011), with three to five million new housing starts occurring annually (Owen, 2012). From 1985 to 2008, the approximate average annual growth in gross output value in the Chinese construction industry was 33%. In 2009, this growth rate was estimated at 22% and in 2010 the total construction sector investment was estimated to be $8.26 trillion USD (AMCHAM, 2011). In 2009 there was approximately 44

billion square meters of buildings in existence in China. The country is constructing an average of 2 billion square meters of floor space on an annual basis (USCS, 2011). It is estimated that there will be an additional 30 billion square meters of new construction by 2020 (Cao, 2009).

Some analysts believe that there is an over development of housing occurring in China, which is creating a market bubble. As a response to the global financial crisis in 2008, the Chinese government injected RMB 13.7 trillion (USD 2.0 trillion) into the economy. It is believed that a large portion of this stimulus may have flowed into real estate development (Lam, 2011). In 2010, research studies were conducted by personnel at the International Monetary Fund (IMF) to ascertain if a housing bubble was beginning to form in China. As of mid-2010, the housing prices for the country were not considered overvalued as a whole, but several locations were identified as being in the early stages of excessive price growth. They include first tier cities Shanghai, Shenzhen, and Beijing. Other cities that are beginning to show excessive price growth signs are Ningbo, Fuzhou, Xiamen. In addition, inland cities Wuhan and Kunming are also demonstrating these signs (Ahuja, et al., 2010). A 2011 "White Paper" conducted by the American Chamber of Commerce in South China estimated that less than 5% of new home sales were occurring in China's first tier cites. The possibility of excess residential housing is visible in Beijing where it was recorded that residential housing sales in 2008 were down 72% from the previous year (AMCHAM, 2011).

The other market segment that is overdeveloped in some locations is subsidized housing projects. A large portion of China's new housing developments are middle class structures occurring in 1st tier cities, creating a housing supply deficit in subsidized housing. Due to the fact that a large portion of the Chinese labor force cannot afford to live in the 1st cites, the Chinese government has built millions of subsidized housing units during the last few years. The placement these projects have often been dictated by government officials that want to promote a particular local economy. When political project designs do not line up with housing demand, buildings are constructed that never become occupied and create ghost towns (Brindley, 2012). However, it should be understood that even though these unoccupied ghost town exist, new housing construction will not stop in areas with continued demand. Real estate developers will continue to construct new housing in regions where there is emerging market demand in the 2nd and 3rd tier cites (Brindley, 2012). Factors that make these cities to be second or third tier include growing urbanization, a rising middle class, and improving infrastructure (CBH, 2011).

It can be expected that politically driven construction projects will continue in the future, even if at lower rates than in the past. The Chinese government is planning on building 35 million low-cost housing units to meet the demand of the growing middle class (Grinter, 2011).

Based on these findings, it is expected that China's real estate market will continue to see growth. Production has slowed in the 1st cities in order for demand to stabilize with supply. New housing construction is expected to continue to grow in emerging 2nd and 3rd tier cites that are experiencing economic growth. The ghost cities that remain unoccupied are associated with poor governmental allocation of resources, and should not be considered to be creating an over-capacity of housing in areas where economic growth is occurring.

In order to identify which geographic segments may be experiencing the largest amount of future real estate growth, two analyses were conducted. The objective of the first analysis was to determine which geographic segments will experience future job growth, because job creation generally correlates with increased demand for housing. The metrics chosen represent the percentage of total Chinese non-real estate capital investment for each province, and were taken from China's National Bureau of Statistics (NBSC, 2012). The top five provinces for non-real estate capital investments are presented in Table 4.6.

Table 4.6: 2011 Top 10 Chinese provinces by non-real estate capital investment

Province	% of Total Investments
Jiangsu Province	8.7%
Shandong Province	8.7%
Liaoning Province	5.9%
Hebei Province	5.5%
Henan Province	5.5%
Guangdong Province	5.3%
Sichuan Province	4.6%
Zhejiang Province	4.6%
Anhui Province	4.0%
Hubei Province	3.9%

Source: NBSC, (2012).

The second analysis involved the creation of a housing forecast for China's provinces and large municipalities. For this forecast, 2010 province population data was grown out to 2015, by using extrapolated annual growth rates, which was determined by comparing 2000 population data with 2010 data (NBSC, 2012). Housing units were determined by estimating the expected

number of people per housing unit. According to China's National Bureau of Statistics, in 2010 the average number of people per household was 3.1, and this amount has been declining by 0.034 people annually between 2000 and 2010. This forecast assumed that this person per household decline will continue to 2015. The results of this forecast are presented in Figure 4.11.

Figure 4.11: Forecasted housing starts for China's largest 13 provinces & municipalities by population
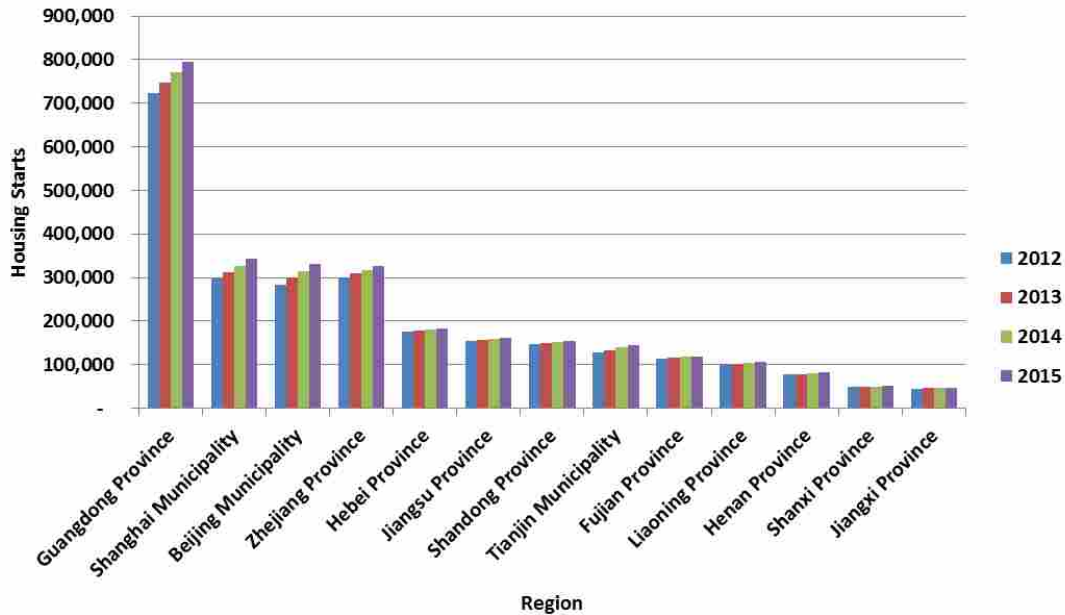
Source: NBSC, (2012).

4.8 Distribution Channels

The closest ocean ports for wood product exports coming from Montana are Seattle and Tacoma, where there are a multitude of ocean carriers that service the trade routes between Seattle/Tacoma and China. Ocean transport of lumber products to China is predominantly done in flat rack containers. These containers can carry a range of 1,500 to 1,833 cubic feet of wood (Jarvis, 2012). A photo representation of a flat rack container is presented in Figure 4.12. Shanghai is the Chinese port predominately used by wood product exporters based out of the Pacific Northwest. Currently, the standard trade practices with the Chinese dictate that U.S. exporters of wood products are only responsible for getting the products to the Shanghai port. At this point the liability is transferred to the Chinese customer (Braden, 2012).

Figure 4.12: Flat rack container

Source: http://www.balticon.pl/en/catalogue/product/40ft_flat_rack_collapside_us.

Research on China has shown that wood product distribution channels are regionally fragmented and the majority of them are relatively new. Log importers usually store their purchased logs in rented warehouses near the ports of entry. The logs are then sold to first tier distributors who then sell the logs to manufacturers or second tier distributors. Second tier distributors sell the logs through their own regional outlets (Cao, et al., 2006; Petry, et al., 2010). Value-added softwood products such as lumber and panels are sold through two distribution channels, which include industrial and retail (Cao, et al., 2006). Large primary manufacturers and distributors generally purchase materials directly from purchasing officers in the source country. Large construction contractors and secondary manufacturers generally purchases products direct from primary manufacturers, 1st tier manufacturers and wholesale wood markets (Cao, et al., 2006; Petry, et al., 2010). The Guangdong Yuzhu International Timber and Wood Wholesale Market is the largest Chinese wood market in terms of imports and is made up of over 400 vendors with annual sales volumes exceeding 70 million cubic feet (SEC, 2011). The contract markets then sell the products to individual construction firms (Cao, et al., 2006).

Retail channels focus on individual consumers where goods are sold through building material stores and western-style home centers (Cao, et al., 2006). Wholesale and retail markets generally purchase products from the supplier or a distributor. The products are then sold to consumers, interior design companies, and small or medium sized manufacturers (Petry, et al., 2010). Finished consumer products such as flooring and furniture are generally distributed

through professional building material markets and showrooms targeted at urban consumers (Petry, et al., 2010). Large construction material super stores are the primary distributors of middle to high end wood products. The four large store chains known at this time are B&Q, Red Star Macalline, Jisheng Wellborn, and OBI (Petry, et al., 2010). A survey distributed by OBI, the second largest home center in 2005 found that 55% of its customers were home owners, 25% interior decorator companies, and 20% were developers and builders (Cao, et al., 2006). A visual analysis of Chinese log and lumber distribution channels is presented in Figure 4.13.

E-business is emerging as a new platform to distribute both raw material wood products and finished products. Online purchases are most popular among the younger generation, with furniture being the primary wood product sold through an E-business platform (Petry, et al., 2010). In 2009 there were an estimated 389 million internet users in China (CIA, 2012).

In order for a U.S. exporting company to enter China, they must gain both trading and distribution rights. Distribution rights cover commission agent services, wholesale services, and retailing (USCS, 2011). There has been a recent large growth of Chinese sales agents capable of handling distribution and marketing. These agents typically do not have import/export authorization and import products through other entities which do (USCS, 2011). A cooperative joint-venture with a Chinese partner is one method that can allow for U.S. export companies to avoid import restrictions and potentially high tariffs. This is done through finishing product production in China. While joint ventures can eliminate many of the import restriction hassles, they are known to be quite time consuming and often result in conflicts of interest. Intellectual property theft is a common complaint of U.S. companies. As a result, almost 75% of the new U.S. investments in China are 100% U.S. owned and listed as wholly foreign-owned entities or WOFEs (USCS, 2011). Conducting due diligence is highly recommended before choosing a Chinese business partner. This can be done through the International Company Profile (ICP) service (USCS, 2011).

Figure 4.13: Chinese softwood log & lumber distribution channels (End customers in red)
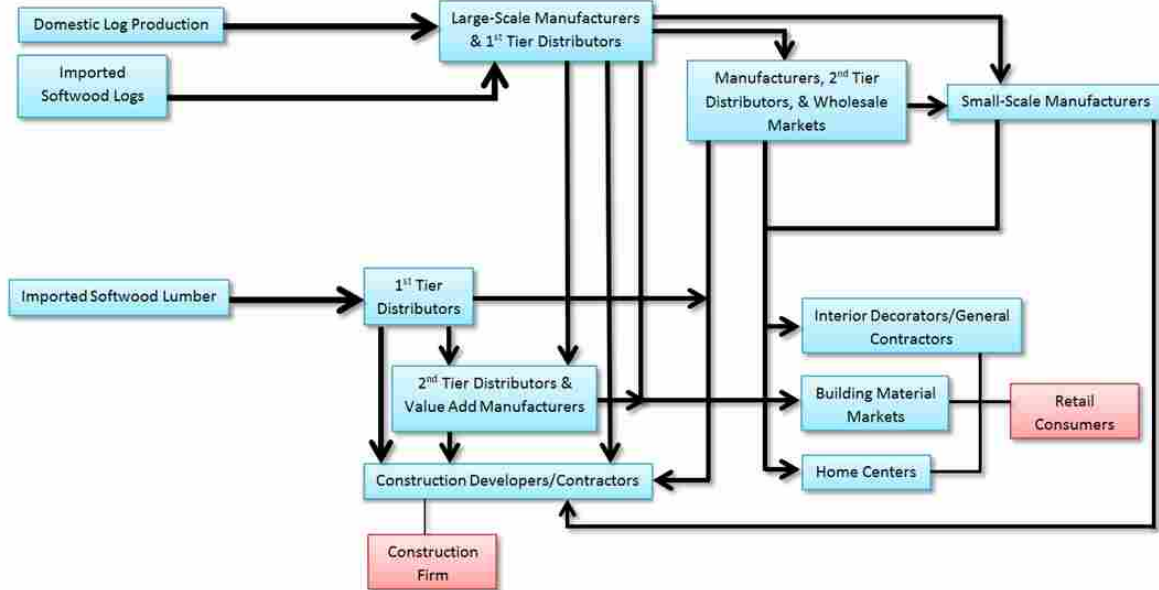
Source: Assimilated from Descriptions Provided by Cao, et al., (2006); Petry, et al., (2010).

4.9 Summary of China's Wood Product Import Market

Based on the findings of China's softwood production and domestic demand for softwood products, it is believed that import demand for softwood lumber will continue into the future. At this time softwood lumber imports are primarily used for real estate housing construction. The primary products desired are dimensional lumber (2x4s) utilized for concrete forms and furring strips. The current market size and growth rate for these products varies by species. The geographic locations where real estate construction is seeing the largest growth is in southern and eastern China along the coast. Market sizes and growth rates vary by province. Industry experts recommend that wood product exporters should focus on 2nd and 3rd tier cities that have not been over-built. Identifying which export opportunities that line up with Montana's resources strengths will be discussed further in Chapter six.

Chapter 5

Montana Wood Product Export Industry Assessment
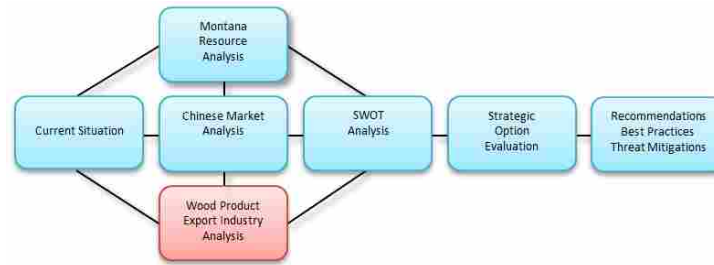
5.1 Chapter Objectives

The first objective of this chapter is to utilize Porter's (2008), model to these five categories as they relate to the wood product export industry to China. Each force component identified by Porter (2008), will be assessed and given score based on the perceived threat level of the component. The scale of the scoring is between 1 and 10, with 10 being perceived as a high potential threat, a 5 indicating a moderate threat, and a 1 being perceived as a low potential threat. The scores of each component are based on the available literature and perspectives of industry specialists. It should be noted that scores are subjective and individuals in possession of information not available to the author may have a different viewpoint on score levels. The second objective of this chapter is to compare the total scores of each force category in order to identify which force category presents the greatest threat.

5.2 The Five Forces Model

An analysis of the wood product export industry to China allows for a greater understanding of the potential industry threats and opportunities. A group or organization's profit potential in an industry is largely determined by the intensity of the competitive rivalry. This observation was determined by Michael Porter (2008), after analyzing multiple industries and the organizations that were successful. Porter (2008) separated competitive rivalry into five forces, which include the threat of entry, the power of suppliers, the power of buyers, substitute products or services, and rivalry among participants. A comprehension of the potential threats related to the wood product export industry and a comparison of intensity levels between Porter's

five forces can be realized through this procedure. For each of these five forces, Porter (2008), was able to identify multiple components. The five forces model and the components of each force are presented in Figure 5.1.

The five forces model has been adapted for this thesis to assess the primary threats faced by Montana wood product manufacturers when exporting their products to China. In this analysis, the threat of entry refers to the establishment of new sawmills that could become future competition for existing Montana mills. The power of suppliers represents raw timber supplier ownership and shipping suppliers that control distribution. The power of buyers refers to Chinese buyers of international wood products. The threat of substitutes refers to products that could be utilized by Chinese buyers instead of dimensional lumber. The threat of industry competitors, represents the existing sawmills in the Pacific Northwest region and the Northern Rocky Mountains that could be competing with Montana sawmills for a share of the Chinese import market. The summary of this analysis is presented in chapter section 5.3, with the component scores displayed in Figure 5.2. The total analysis is presented in Appendix D.

Figure 5.1: Five forces model of the wood product export industry

Threat of Entry

1. Economies of scale.
2. Product differentiation.
3. Capital requirements.
4. Cost disadvantages.
5. Access to distribution.
6. Government regulations.

New Mill Entrants

Supplier Power

1. Few dominant suppliers.
2. High switching costs.
3. Few substitutes.
4. Supplier production integration.
5. Industry comprises small portion of supplier revenue base.

Raw Timber Supplier Ownership
Shipping Suppliers (Truck, Rail, Ship)

Industry Competitors

1. Number of mills.
2. Industry growth.
3. Fixed costs.
4. Capacity increments.
5. Exit barriers.

Existing Mills

Buyer Power

1. Minimal buyers, large volume purchases.
2. Low switching costs for buyers.
3. Few substitutes.
4. Buyer's purchases represent majority of seller's revenue.
5. Buyers can integrate backward.

Chinese Buyers

Substitute Products or Services

1. Lower price in relation to industry average.
2. Companies have large production capacity.

Lumber Substitutes

Source: Adapted From De Kluyver, (2012).

Figure 5.2: Scoring of the Five Forces Analysis components
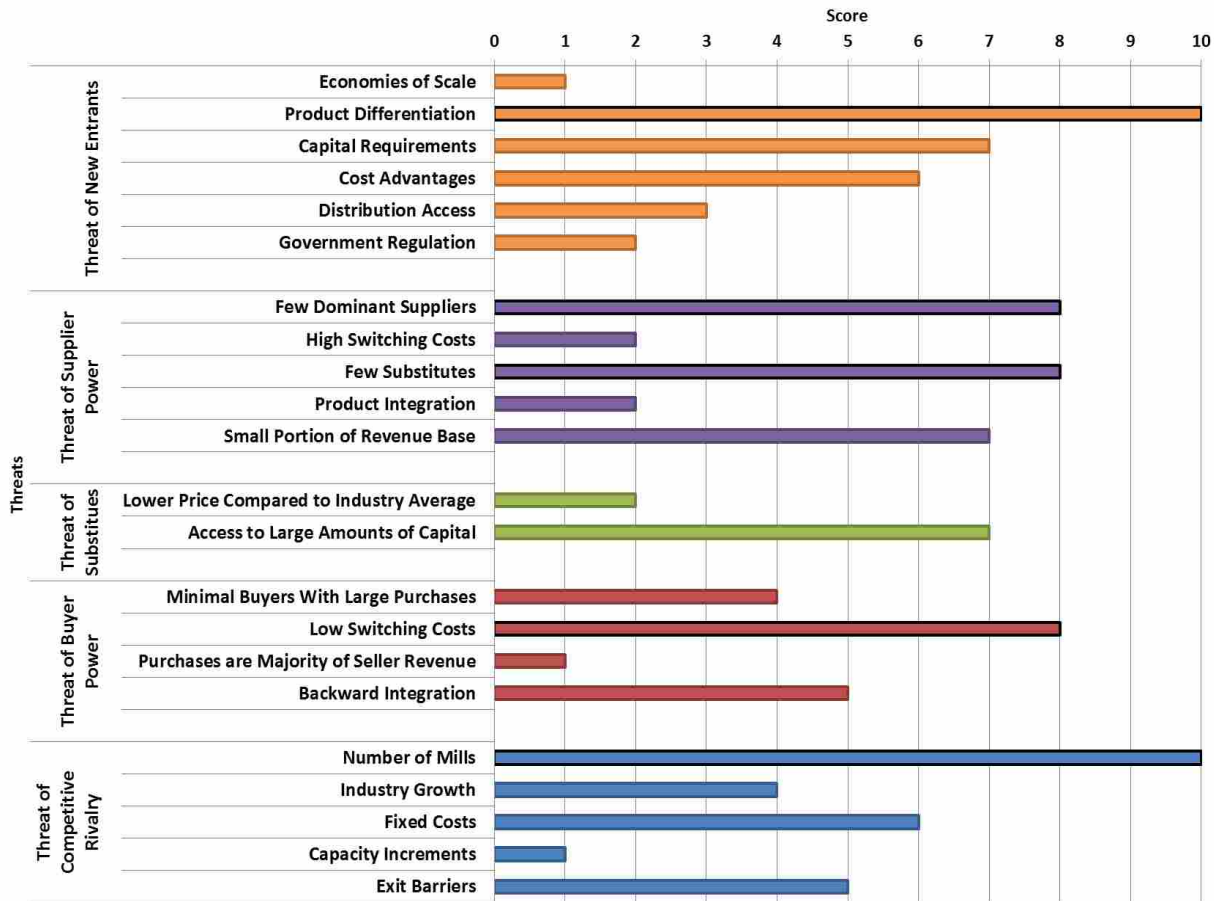
5.3 Five Forces Summary

Upon completing the five forces analysis, it was found that the strongest threat forces for this industry are from the supplier power groups and the competitive rivalry group. The high threat of supplier power is due to a large portion of Montana's net harvestable timber existing on National Forest lands, which have been experiencing decreasing harvest levels during the last two decades. The challenge this creates for Montana manufactures is that, even if additional product markets are found in China, there is no guarantee that timber supplies will be available for manufacturing additional lumber to supply this market.

The high threat of competitive rivalry is due to the large amount of existing mills that could be in competition with Montana mills for this export industry. A competitive advantage that sawmills existing in British Columbia, Washington, and Oregon have over Montana mills is their closer geographic location to ocean ports. This factor creates an extra shipping cost that

Montana mills will have to account for in this industry. In order to assess the financial impact of this factor, a residual value cash flow analysis was conducted, which is presented in Table 5.1.

Table 5.1: Residual value cash flow analysis for #3 utility 2x4 exports to China

Cash Flow Factors	U.S. Inland[1]	U.S. Coast[2]	Canada Coast[3]
China-1st tier distribution market price per MBF[4]	$ 325.50	$ 325.50	$ 325.50
Average rail shipping cost per MBF[5]	$ 30.50	$ 1.83	$ 1.83
Average ocean carrier cost per MBF[6]	$ 55.20	$ 55.20	$ 55.20
Insurance (1% of supply cost)[7]	$ 2.26	$ 2.40	$ 2.17
Freight forwarder fee per MBF[8]	$ 0.06	$ 0.06	$ 0.06
Customs clearance fee per MBF[9]	$ 0.06	$ 0.06	$ 0.06
Total shipping cost	$ 88.08	$ 59.55	$ 59.32
Maximum competitive mill F.O.B.	$ 237.42	$ 265.95	$ 266.18
Average 2011 mill F.O.B. price[10]	$ 226.00	$ 240.00	$ 217.00
Additional profit above mill F.O.B. price	$ 11.42	$ 25.95	$ 49.18

Notes: 1 U.S. inland refers to eastern Oregon, eastern Washington, Idaho, Montana, and Wyoming.
2 U.S. coast refers to western Oregon and western Washington.
3 Canada coast refers to British Columbia
4 Source: Braden, (2012).
5 Source: Lewis, (2012).
6 Source: Stewart, (2012).
7 Source: Weiss, (2008).
8 & 9 These are flat rate fees required for each shipment. According to Weiss (2008), the average cost for each freight forwarder fee and each customs clearance fee is $200. For this cash flow analysis it was assumed that the order size was 3.62 MMBF, which was the average monthly import volume for thirty Chinese companies surveyed in 2011 (SEC, 2011).
10 Source: RandomLengths, (2012c).

As can be seen in Table 5.1, it is possible for Montana lumber mills to be profitable in this market even with the addition of the rail cost to west coast ports. While coastal lumber mills in Oregon, Washington, and British Columbia are able to make a large per MBF profit, Montana lumber mills can still participate in this market. It should be noted that these market and sales prices are the 2011 average for the specified regions. If Chinese market prices decline or U.S. demand for these products rise, the profitability of this market may decline.

Upon completion of the five forces analysis it was found that the threat of new entrants force group received a fairly high score based on the analysis methods outlined by Porter, (2008). This high score was primarily due to the fact that lumber is a commodity product with

little or no differentiation, and that the capital requirements for establishing a sawmill are relatively low when compared to establishing other new developments, such as coal, oil, or natural gas. However, a historical examination of the wood products industry reveals that the number of new sawmill establishments is low, with the number of mills going out of business being much higher than new mill establishments. Based on these findings, it is believed that the actual threat of new entrants for this industry is much lower than the analysis scoring system dictates.

The primary threats that are expected to create challenges for Montana wood product manufacturers, if they choose to supply the Chinese market, are the challenges of procuring raw timber supplies, the high level of existing competition from British Columbia, Washington, Oregon, and Idaho, and the buyer threat due to the fact that Chinese buyers are known to be price sensitive and that lumber is a commodity product with little to no differentiation.

Chapter 6

SWOT Analysis of Exporting Montana Wood Products to China
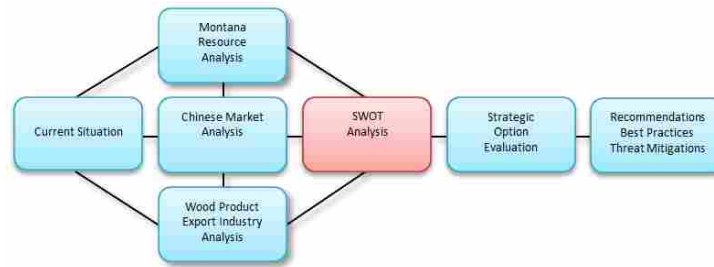
6.1 Chapter Objectives

A SWOT analysis is tool utilized for determining a group or organization's strengths, weaknesses, external opportunities, and threats (De Kluyver, 2000). The first objective of this chapter is to discuss these four factors for Montana's primary wood product manufacturers in regards to exporting wood products to China. This will be done by utilizing the research findings in sections 3.9, 4.8, and 5.3. The second objective of this chapter is to present a strategic situation summary that describes the strength or weakness of the competitive position of Montana's wood product manufacturers compared to key competitors. The purpose of this second objective is to identify the strategic posture may be most beneficial for Montana manufacturers choosing to enter to Chinese export market.

6.2 Strengths of Montana Wood Product Manufacturers

In regards to raw timber supply, the strength primarily exists in the supply of small diameter trees (7.0"-14.9"). The trees species with the greatest net harvestable supply are Douglas-fir, lodgepole pine, ponderosa pine, western larch, and Engelmann spruce. The additional available net harvestable supply at current utilization rates is approximately 2.9 billion CF. The annual net growth rate for these species is approximately 71.2 MMCF. This conclusion was based on the IW-FIA (2009), inventory analysis that was conducted in chapter three. While 64% of the potentially available timber exists on National Forest land, the annual harvest levels conducted by the U.S. Forest Service have been in decline, and for this analysis are viewed as a threat to wood product manufacturers. Therefore, it is determined that the primary raw timber supply strength exists on private lands.

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The primary wood product manufacturing strength for Montana is in sawmills. There are approximately 41 existing sawmills in Montana. Of these 41 sawmills, the 11 largest are responsible for 98% of the total production (McIver, et al. 2012). Montana also has 4 wood panel manufacturers, which include plywood, particleboard, and MDF. Montana's particleboard plant represents 17% of the total particleboard producers in Montana, Idaho, Oregon, Washington and British Columbia. Montana's MDF plant represents 33% of the total MDF producers in this same area. The majority of large mills are located in northwestern and western Montana near the raw timber supply. In addition, the majority of them are located on or near major rail lines. According to survey research conducted by the Bureau of Business and Economic Research, the production capacity (Timber inputs) of Montana's mills is approximately 127.9 MMCF (McIver, et al. 2012). Assuming a sawn wood mill recovery factor of 41.4%, as was the case in 2009, lumber output capacity was 31.9 MMCF in 2011. There is an additional lumber output capacity of approximately 23.3 MMCF of products could be produced without having to increase the existing manufacturing infrastructure. Furthermore, many of Montana's lumber mills have incorporated advanced mill technologies capable of minimizing waste and maximizing production speed (Hayes, 2011). In comparison to North American mill capabilities, many of the wood manufacturing mills in China are inferior (Owen, 2012).

6.3 Weaknesses of Montana's Wood Product Manufacturers

The greatest weakness of Montana wood product manufacturers is a lack of experience in exporting products to Asia. According to data collected by the Department of transportation, approximately 94% of Montana's wood product exports are shipped to Canada, 4% are shipped to Mexico, and less than 1% is shipped to Asia and other countries (FAF, 2011). According to forestry consultants in Montana, the primary reason that wood product manufacturers are not exporting to Asia is that they do not know what types of products are in demand and they do not understand the export process or how to establish international business relationships (Rawlings, 2011). This puts Montana manufacturers at a disadvantage since competitive manufacturers in Oregon, Washington, and British Columbia have been exporting wood products to Asia for the last few decades (Owen, 2012).

The second major weakness experienced by Montana manufacturers is the distance from ocean ports in Seattle and Tacoma, which is approximately 500 miles. This can be a large disadvantage because it represents an additional shipping cost. In order to make up for this additional cost and improve profit margins, it will require Montana mills to lower production costs or differentiate their sales offering in a way that will encourage Chinese buyers to purchase Montana lumber.

6.4 Potential Chinese Export Market Opportunities

As was demonstrated in chapter four, China is experiencing a large amount of growth in their real estate market. Housing construction is primarily conducted with concrete, but relies heavily on dimensional lumber. The two primary opportunities in China are 2x4s imports being used for the construction of concrete forms and 2x4s being used for furring strips, which are used to attached drywall and floors to the interior concrete surfaces. The advantages for Montana manufacturers in regards to these two opportunities are the large market sizes, strong growth rates, and potential to reach adjacent geographic market segments that may experience future real estate growth.

6.5 Potential Threats for Montana Wood Product Manufacturers

In a chapter five (and Appendix D), a five forces analysis was conducted that represented an in-depth look at the potential threats faced by Montana wood manufacturers. For this analysis 22 threat factors were assessed and given a score to determine their severity. The 10 threats with the highest severity are presented in Figure 6.1.

Figure 6.1: Primary threats revealed in the five forces analysis
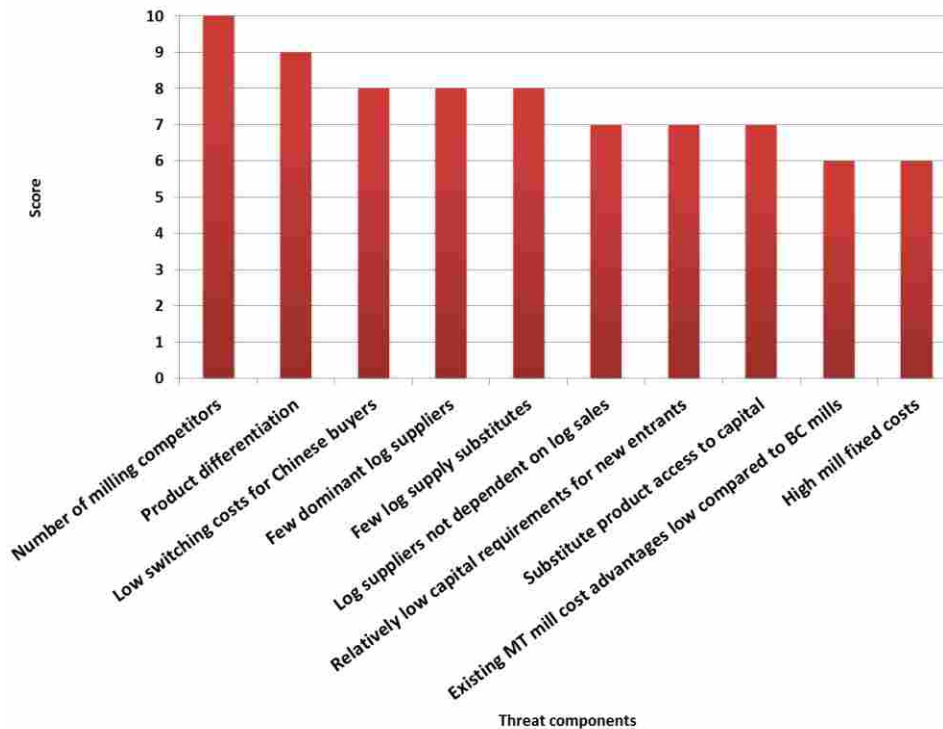
The primary threat is the number of milling competitors. Montana sawmills represent just 7% of the total sawmills in British Columbia, Washington, Oregon and Idaho (RandomLengths, 2012a). Due to the fact that these mills have high levels of fixed costs, it can be expected that there will be a strong reaction when market share is lost to a competitor. This is an important factor to consider for Montana manufacturers because success will be much more likely if competitor retaliation is avoided.

The secondary threats are the low-switching cost for Chinese buyers, which are driven by low product differentiation, large purchase orders by 1st tier distributors, and high price sensitivity of buyers. This poses a challenge for Montana manufacturers because in order to gain and hold market share, it will be necessary to provide a service to negate the threat of low-switching costs by Chinese buyers.

The tertiary threat is the supply of raw timber being controlled by a minimal number of suppliers. According to the timber analysis conducted in chapter three, there is 2.3 billion cubic feet of timber distributed between Douglas-fir, lodgepole pine, ponderosa pine, western larch, and Engelmann spruce (IW-FIA, 2009). Of this amount, 62% exists on National Forest land.

Due to the declining timber harvests on National Forest lands that was discussed in chapter three, it may not be possible to utilize this additional available timber supply. Furthermore, private land suppliers may not feel forced to make up the decline in federal timber harvests if they feel that the highest and best use of their land would be for another activity such as real estate development or conservation easements. A further supplier threat is the existing monopoly power possessed by BNSF. As the primary rail provider between Montana and Seattle/Tacoma, BNSF has the ability to control the shipment cost and raise rates. Many lumber producers are extremely agitated over the rate hikes and record profits being received by railroads such as BNSF and Union Pacific (RandomLengths, 2012b).

6.6 Strategic Situation Analysis

A strategy situation analysis takes the factors identified in strengths, weaknesses, opportunities, and threats, and presents them in a manner that allows one to identify the strategic posture that a group or organization should consider (De Kluyver, 2000). When there are a large number of external opportunities and substantial internal strengths, an aggressive or bold posture should be taken. In contrast, when there is large amount of external threats and several internal weaknesses a defensive posture should be taken. The combination of multiple external threats and substantial internal strengths requires a diversification strategy. Finally, a situation involving internal weaknesses combined with multiple external opportunities suggests a turn-around oriented strategy. A representation of strategic posture analysis is presented in Figure 6.2.

Figure 6.2: SWOT & Strategic Posture Analysis
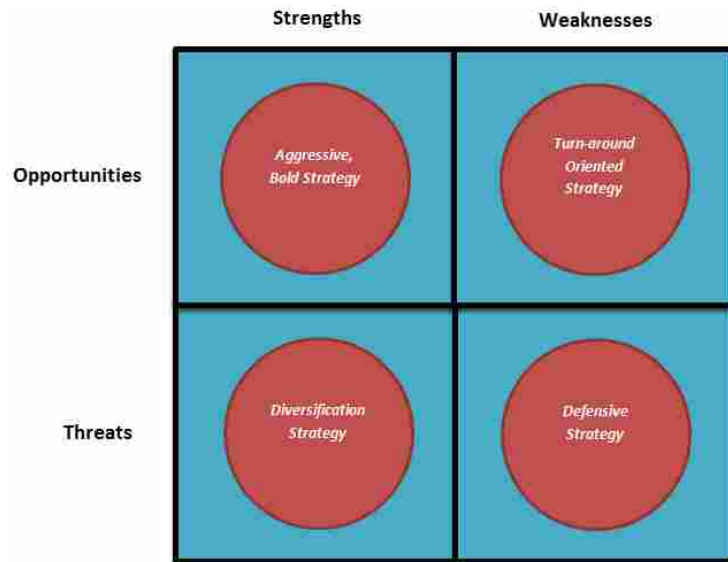
Source: De Kluyver, (2012)

This analysis reveals that it is beneficial for Montana wood product manufacturers to take variations of all four possible postures, in order to address the various strengths and weaknesses that they possess. The area that strengths and opportunities align is the large Chinese demand for softwood 2x4s and Montana's primary focus on manufacturing dimensional lumber. In this regard, Montana manufacturers should take an aggressive posture for capturing market share.

The area that strengths and threats align, is that there is a large amount of sawmill competitive rivalry, all trying to capture a portion of the market. In this regard, Montana manufacturers should aggressively pursue export opportunities of softwood 2x4s, but with a diversification strategy. Diversification should include species geographic location segments, and customer segments. The goal of the various diversification strategies is to reduce or eliminate the external threats. The diversification strategy options will be discussed in chapter seven, with recommendations provided in chapter eight.

Internal weaknesses and opportunities align with Montana manufacturers having minimal experience in exporting wood products to Asia combined with a declining workforce. This factor will make it challenging for Montana manufacturers to have a rapid response to export opportunities as they become available. This position requires a posture focused on Montana manufacturers mitigating their internal weaknesses by developing a turn-around oriented strategy

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focused on increasing their international market knowledge and export abilities. Best practices for accomplishing this feat are presented in chapter nine.

Internal weaknesses and threats align with Montana manufacturers being geographically located a large distance from ocean ports, combined with BNSF rail carrier having monopoly powers and Chinese buyers having high price sensitivity and low switching costs. Furthermore, Montana manufacturers are threatened by 64% of the potential timber supply being unavailable for export production due to declining federal land timber harvests. This situation requires Montana manufacturers to take a defensive posture that improves weaknesses and avoids threats. Mitigation strategies to combat these threats and internal weaknesses are discussed in chapter nine.

6.7 SWOT Analysis Summary

In this chapter, the strengths and weaknesses of Montana's forest industry were assessed, along with the Chinese export market opportunities, and the lumber export industry threats. Based on this analysis, it has been determined that Montana manufacturers should assume a strategic posture that primarily aggressively pursues dimensional lumber exports (2x4s) while employing a diversification mix that capitalizes on the most advantageous and competitor-free market segment groups (product species, geographic location, and customer group). An in depth analysis of the most advantageous segment groups is presented in chapter seven, with recommendations provided in chapter eight. In order to improve the competitiveness of Montana manufacturers, best practices should be identified that can allow for Chinese buyers to receive the lowest possible bottom line cost for lumber supply procurement. These best practices are discussed in chapter nine. Mitigations should also be identified that can reduce the large rail shipping costs and open up to total potential raw timber supply in Montana. These mitigation strategies are also presented in chapter nine. The pursuance of the most advantageous diversification mix, best practices for competing in the Chinese lumber export market, and threat mitigations towards supply challenges will provide Montana manufacturers with a competitive advantage that can be applied to increasing their wood product exports.

Chapter 7

Strategic Options for Exporting Montana Wood Products to China
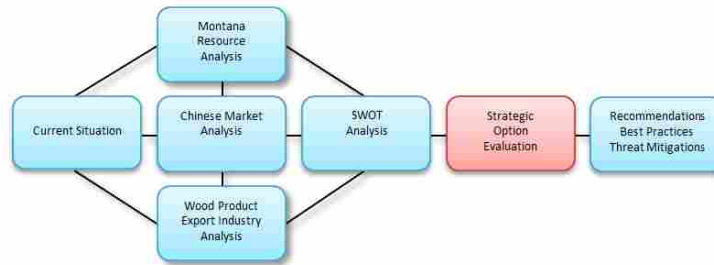
7.1 Chapter Objectives

The goal of chapter seven is to evaluate the potential export market opportunities that Montana wood product manufacturers can choose from. Findings in the chapter six SWOT analysis determined that Montana manufacturers should assume a strategic posture that primarily aggressively pursues dimensional lumber exports (2x4s) while employing a diversification mix that capitalizes on the most advantageous and competitor-free market segment groups (product species, geographic location, and customer group). The first objective of this chapter is to evaluate the various wood product options by species and product type and identify which ones provide the best opportunity for Montana manufacturers. The second objective of this chapter is to evaluate the various Chinese geographic market segments and identify which ones have the best potential for future demand. The geographic marketing segments are presented by Chinese provinces and municipalities. The third objective of this chapter is to discuss the various Chinese customer segment groups for lumber products and identify the pros and cons of each one. These objectives are addressed in sections 7.2, 7.3, and 7.4 respectively. The completion of these three objectives will provide the needed analysis for choosing the potential marketing mix options for Montana wood product manufacturers.

7.2 Wood Product Marketing Mix

In chapter 5 it was discussed that it would be most advantageous for Montana wood product manufacturers to aggressively pursue export opportunities of softwood 2x4s, but with a diversified marketing mix due to high levels of competition. While Montana is capable of

supplying multiple species/product mixes, it is important to determine which product mix provides the best fit between China's import needs and Montana's supply capabilities. In order to discover which product marketing mix should be pursued, three market characteristics were analyzed: product demand, timber supply, and supply price. A scatter plot matrix scoring system was designed so that a score could be applied to each product type in each category.   The scatter plot matrices are divided into nine sub-groups, which are arranged by three sub-sections on the x-axis and the three sub-sections on the y-axis. Each sub-section on each axis is labeled low, medium, or high to assist in scoring the potential export opportunities. This analysis employs a basic scoring method where the score for each sub-group is the sum of the number cells to the right of point zero on the x-axis and the number of cells above point zero on the y-axis. A grid demonstrating the scoring for each sub-group is presented in Figure 7.1. Upon completion of this analysis, a hierarchy of product mixes was created that represent the best potential product export opportunities for Montana manufacturers based on the sum of scores for the three market characteristics assessed.

Figure 7.1: Scatter plot matrix scoring allocation

The first category assessed was product demand. In chapter four, Chinese softwood lumber import statistics were presented that were collected by the USDA Foreign Agriculture Service and shared by the Softwood Export Council. These statistics represented U.S. softwood lumber export values to China for 2011, and allowed for an extrapolation of the average annual growth rates between 2009 and 2011. The statistics were incorporated into a scatter plot matrix in order to provide an evaluation of the potential opportunity associated with each

product/species type. All of the product types presented are made from species that grow in Montana and can be produced by manufacturers. These products were presented in Table 4.4. The four digits linked to each product are the last four digits of the products ten digit harmonized code, which is a code used for the tracking of international product imports and exports. The scatter plot matrix for product demand is presented in Figure 7.2.

Figure 7.2: Chinese Wood Product Demand Matrix
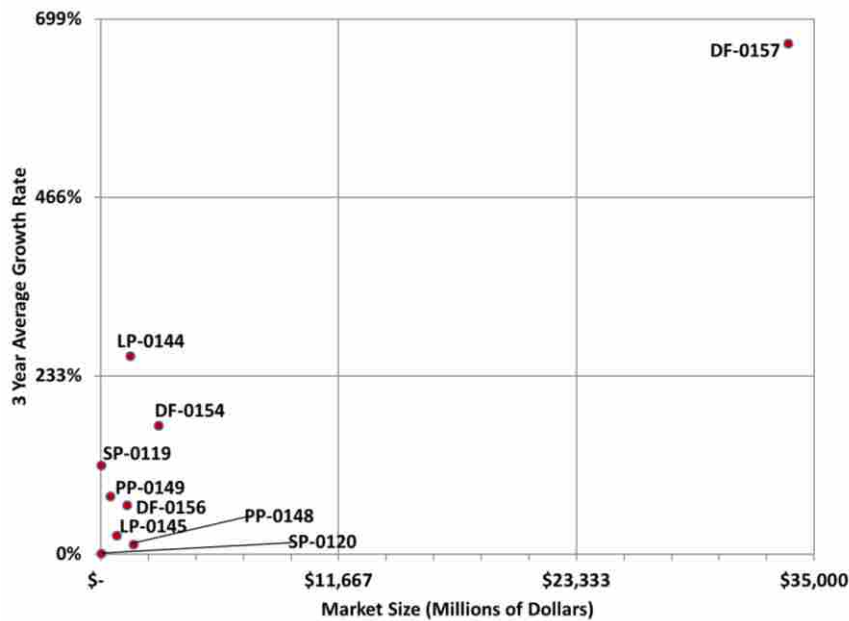
The second category that was assessed was Montana timber supply. The volumes utilized were taken from the (IW-FIA, 2009) findings in chapter three, which represent estimated available harvestable timber volume by species. Scatter plot matrices were designed with timber supply per species in cubic feet on the x-axis and the annual growth per species in cubic feet on the y-axis. The annual growth rates were included because it was found that in addition to supply availability, Chinese buyers are concerned with long-term supply stability (SEC, 2011). The species that were included were based on the four Chinese product demand species in Figure 7.2.

The first supply matrix for this category, Figure 7.3, only utilized private timberland in Montana because it is assumed that free-market principals will dictate that timber harvest will increase if there is a market for products. The second supply matrix, Figure 7.4, was created for

timber on National Forest Land in order to assess future opportunities if harvest polices on National Forest Lands change in the future in such a way that market opportunities can be pursued. A third supply matrix, Figure 7.5, was created that included all timber land ownerships in Montana, which includes National Forest, private, other federal, and state & local government timberlands. A separate matrix was not created for other federal and state & local timber lands because these ownership classes represent just 5% of the analyzed timber volumes (IW-FIA, 2009). These scatter plot matrices were constructed with the same methods discussed for the matrix in Figure 6.2. In some cases, the net annual growth rates had negative values. These supply species/groups are marked at the 0.0 point of the y axis and did not receive any y axis points.

Figure 7.3: Private Timber Supply Matrix
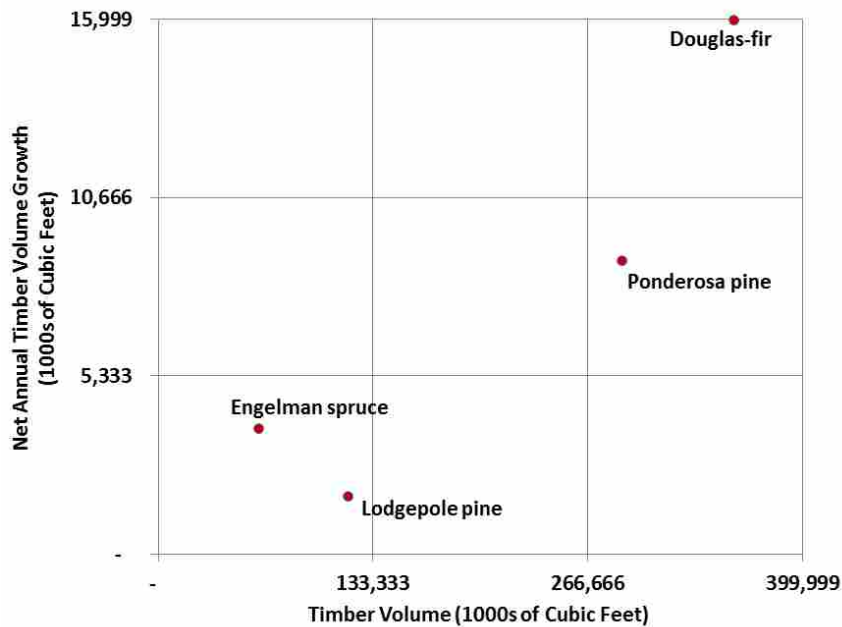
Source: Data Collected from IW-FIA, (2009)

Figure 7.4: National Forest Timber Supply Matrix

Figure 7.5: Montana Total Timber Supply Matrix
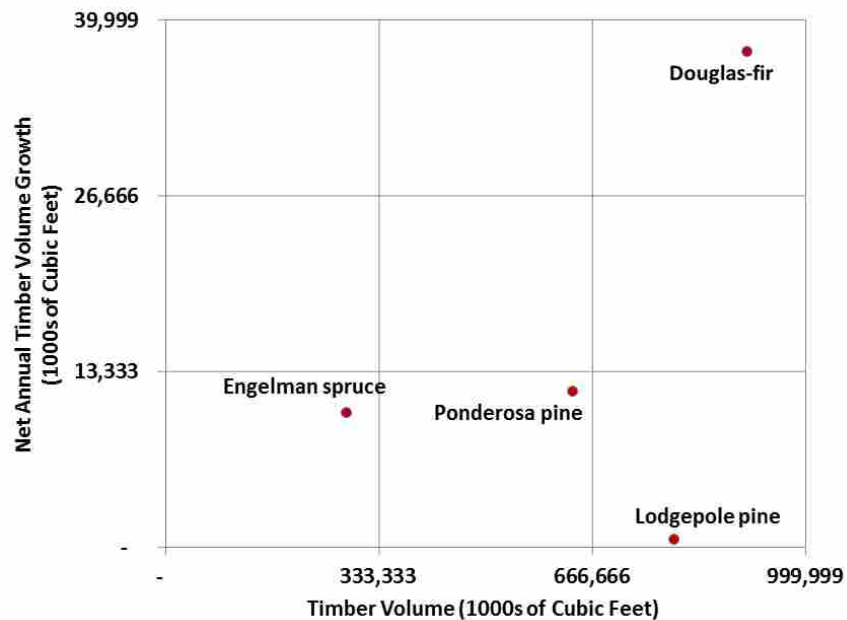
The third market characteristic assessed was supply price. A scatter plot matrix was designed that incorporated average western Montana log prices by species for the third quarter of

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2012, and price volatility by species. Price volatility was included because Chinese buyers are concerned with supply stability (SEC, 2011). It is assumed that species with high price volatility would be less preferable to Chinese buyers. The log prices were collected from the Bureau of Business and Economic Research, and represent average cubic foot prices reported by primary manufacturers for the third quarter of 2012 (BBER, 2009-2012). The price volatility by species was calculated by taking the standard deviation for each species log price over the last 7 quarters (2011 Q1 – 2012 Q3). The supply price matrix is presented in Figure 7.6. It should be noted that the x and y axes have declining values. This was done because success in China will be improved with access to consistently low-priced logs.

Figure 7.6: Supply Price Matrix
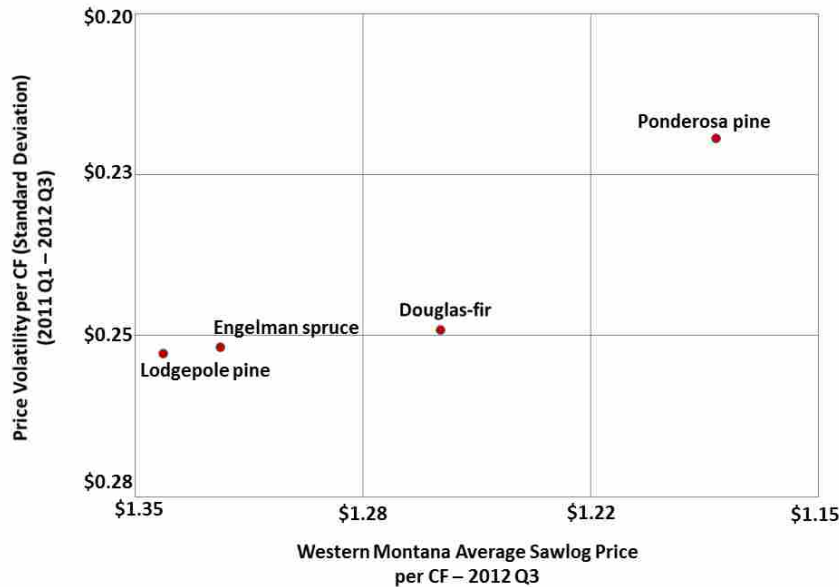
Source: Data Collected from the BBER, (2009-2012)

Upon the completion of each market characteristic analysis, the scores were summed and arranged in a hierarchical order. Table 7.1 presents the product mix that provides the best fit for timber being harvest off of private lands. Table 7.2 presents the best product mix for National Forest lands, and Table 7.3 provides the best fit for Montana's total timber supply. A description of the product codes presented in these tables is provided in Table 4.5.

Table 7.1: Private timber supply best-fit hierarchy

Product Code	Demand Score	Supply Score	Price Score	Total Score
DF-0157	6	6	4	16
PP-0148	2	5	6	13
PP-0149	2	5	6	13
DF-0154	2	6	4	12
DF-0156	2	6	4	12
LP-0144	3	2	2	7
LP-0145	2	2	2	6
SP-0119	2	2	2	6
SP-0120	1	2	2	5

Table 7.2: National Forest timber supply best-fit hierarchy

Product Code	Demand Score	Supply Score	Price Score	Total Score
DF-0157	6	6	4	16
DF-0154	2	6	4	12
DF-0156	2	6	4	12
PP-0148	2	3	6	11
PP-0149	2	3	6	11
LP-0144	3	3	2	8
LP-0145	2	3	2	7
SP-0119	2	3	2	7
SP-0120	1	3	2	6

Table 7.3: Montana total timber supply best-fit hierarchy

Product Code	Demand Score	Supply Score	Price Score	Total Score
DF-0157	6	6	4	16
DF-0154	2	6	4	12
DF-0156	2	6	4	12
PP-0148	2	3	6	11
PP-0149	2	3	6	11
LP-0144	3	4	2	9
LP-0145	2	4	2	8
SP-0119	2	2	2	6
SP-0120	1	2	2	5

As can be seen in these tables, Douglas-fir products consistently have the highest scores followed by ponderosa pine, lodgepole pine, and then spruce. This is due to the high demand for Douglas-fir products and the large supply of Douglas-fir timber in Montana. The only difference is presented on private land due to the high levels of ponderosa pine timber supply, combined with lower prices per cubic foot than for Douglas-fir. The recommended product mix that Montana manufacturers should market to Chinese importers is presented in chapter eight.

7.3 Chinese Geographic Market Segments

Market analysts believe that 85% to 90% of China's softwood imports are being utilized for real estate construction (Brindley, 2012). The two socio-economic characteristics that were chosen to predict potential future housing demand were population growth and job creation. For the first category, the statistics that were utilized were Chinese province population size and growth rates. These metrics were chosen because a large portion of Chinese people migrating towards eastern provinces in search of new jobs (CIA, 2012). This growing labor force represents new potential housing that will be needed. For the second category, the statistics that were utilized were 2011 capital investment percentages by region and regional industrial output growth in January through August in 2012. These statistics were chosen because they provide a chance to identify where new jobs are being created, and thus more likely to have a population that can afford new housing. The four measurement factors were combined into two scatter plot matrices in order to assess which geographic segments will have the largest future demand for housing construction in China. The statistics for both categories were collected from the National Bureau of Statistics for China (NBSC, 2012).

The first category scatter plot matrix is presented in Figure 7.7, and includes population size and annual growth rates for all provinces and the Beijing, Shanghai, and Tianjin municipalities. In some cases, the provinces had a negative growth percentage. These provinces are marked at the 0.0 point of the y axis and did not receive any y axis points. The second scatter plot matrix is presented in Figure 7.8 and includes regional percentage of total 2011 non-real estate capital investment and regional industry growth for January 2012 to August 2012. The scores for both categories were weighted equally and then summed to identify the best potential opportunities for future housing construction in China. The top ten scoring regions are presented in Table 7.4 and are arranged in hierarchical order. The scores for all of the regions are presented in Appendix D.

Figure 7.7: Chinese regional population analysis
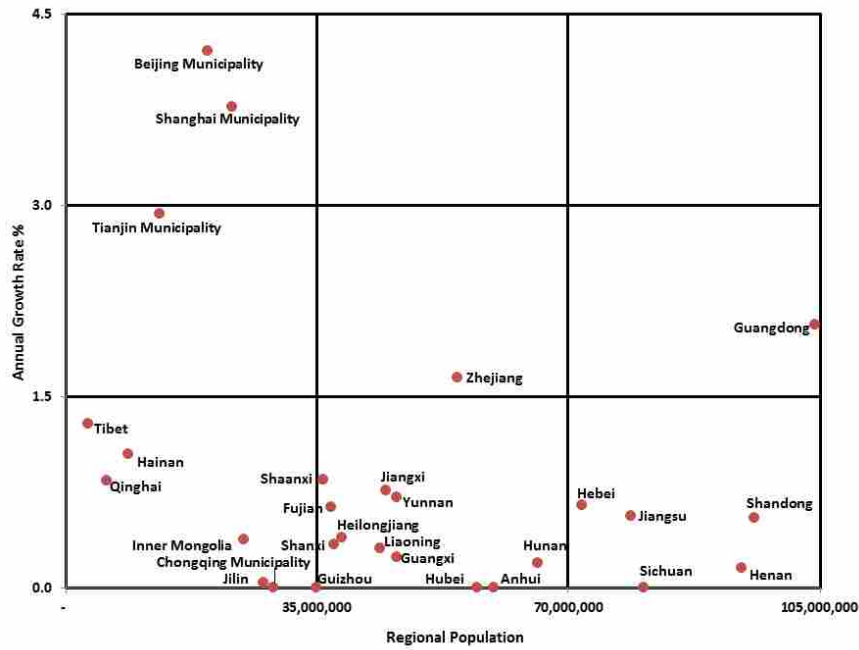
Source: Data was Collected from NBSC, (2012)

Figure 7.8: Chinese regional capital investment & industry growth
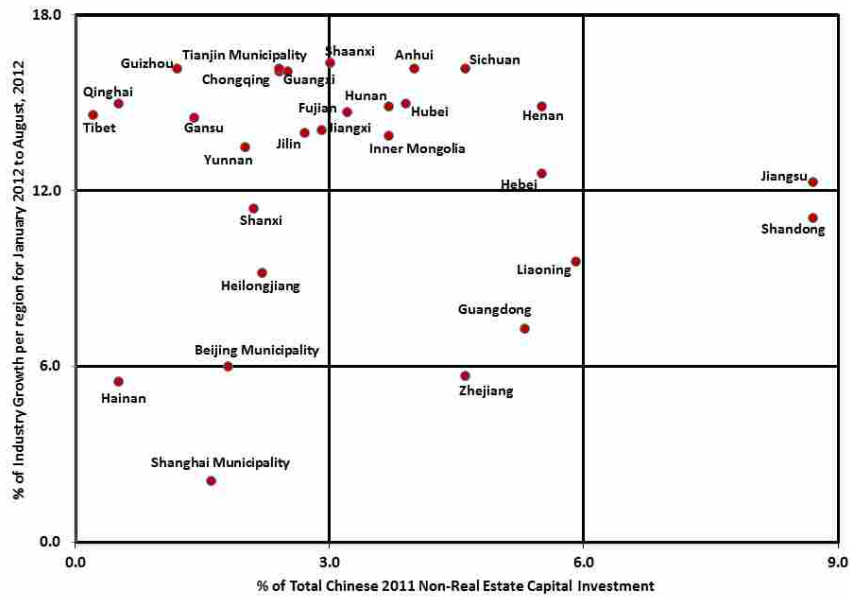
Source: Data was Collected from NBSC, (2012)

Table 7.4: Top 10 Chinese provinces for expected future housing construction

Region	Population Score	Job Creation Score	Total
Jiangsu Province	4	6	10
Guangdong Province	5	4	9
Hebei Province	4	5	9
Henan Province	4	5	9
Shandong Province	4	5	9
Fujian Province	3	5	8
Hunan Province	3	5	8
Sichuan Province	3	5	8
Shaanxi Province	3	4.5	7.5
Shanxi Province	3	4.5	7.5

As can be seen in Table 7.4, the Jiangsu Province presents the best potential opportunity for future housing construction. This is followed by the Guangdong, Hebei, Henan, and Shandong provinces, which each had a total score of 9. Based on these results, it is assumed that these ten provinces provide the best opportunity for geographic market segments.

7.4 Chinese Customer Segmentation

Four primary customer groups have been identified in China that can be potential importers of Montana lumber: (1) 1st tier distributors; (2) 2nd tier and 3rd distributors; (3) construction developers/contractors, and (4) construction firms.

The 1st tier distributors typically have warehouses in large port cities and generally have purchasing officers in the source countries that arrange the majority of sales (Cao, et al., 2006). According to industry specialists, there are just a small number of these large 1st tier distributors, but they represent between 40% and 60% of all lumber imports (Braden, 2012). The advantages of working with 1st tier distributors are that they are experienced wood product importers and have already obtained the required license documents from the Chinese Ministry of Commerce (Collins & Block, 2007). In addition, they will typically have a well-established distribution network and pre-identified buyers. These factors can make the ease of conducting business much more prevalent. The disadvantage of working with 1st tier distributors is that they are first in line in the Chinese supply chain and will ask for the lowest price. Distribution expenses in China are among the highest in the world and can drastically increase the final price for the end customer (Collins & Block, 2007).

The 2nd tier and 3rd distributors set up to serve particular regions of smaller distributors or end customers. They typically purchase products from larger manufacturers or other distributors that are below them on the supply chain. This group segment also represents wholesale wood markets that are made up of numerous vendors (Cao, et al., 2006). It is believed that this customer segment group represents approximately 50% of wood product imports and represents the majority of Chinese wood product import businesses (Braden, 2012). The advantage of targeting 2nd and 3rd tier distributors is that they are higher on the supply chain and may be willing to pay a higher price than the 1st tier importers. The disadvantages are that these groups may have less import experience and not fully understand all of the import procedure requirements. Furthermore, these companies are likely to have smaller access to financial capital, which would decrease potential order sizes.

The construction developers/contractors are groups that receive contracts for large real estate development projects. They typically make their purchases from 1st, 2nd, and 3rd tier distributors (Cao, et al., 2006). The advantages and disadvantages of targeting this segment group is similar to the 2nd and 3rd tier distributor group. Better sales prices can be realized, but import experience should be expected to be lower. A further advantage is that this group is much closer to the end customer and therefore has a better understanding of what the end product needs are. By developing a better understanding of these product needs, Montana manufacturers may be able to add value to the transaction and provide product specifications that are more desirable than products provided by distributors further down the supply chain.

The final customer group is represented by the individual construction firms hired for development projects. This group typically makes their purchases from the construction developers/contractors. Due to the fact that Chinese buyers are highly price sensitive, greater value can be realized for Montana manufacturers if the customers are closer on the supply chain to the construction firms. The disadvantage is that these firms will typically be more concerned with housing construction than searching for better supply sourcing deals. Import experience levels are expected to be minimal to non-existent. Furthermore, the size of supply orders would be expected to be much smaller since the volume purchased will be dictated by the size of the individual construction projects.

7.5 Summary of Strategic Options for Exporting Montana Wood Products to China

The goal of this chapter was to identify the potential lumber product mix options that would provide the best fit for Montana wood product manufacturers. Hierarchical lists were created for product types by species/harmonized code and Chinese geographic market segments. The top product identified as being the best fit for Montana manufacturers was of the Douglas-fir species (DF-0157), which was labeled as having a thickness greater than 6mm and received surfacing, according to Schedule B Export Codes (USDC, 2012b). This was followed by the remaining two Douglas-fir product codes and the two ponderosa pine product codes. The order of these four product codes varied between National Forest and private land ownership. The top geographic market segments that were identified as the best potential for future lumber demand include Jiangsu, Guangdong, Hebei, Henan, and the Shandong provinces.   The various customer segment groups were discussed along with their pros and cons for conducting business. By utilizing this analysis a recommended marketing mix portfolio was generated. This recommendation is presented in chapter eight.

Chapter 8

Strategic Option Recommendations for Exporting Montana Wood Products to China
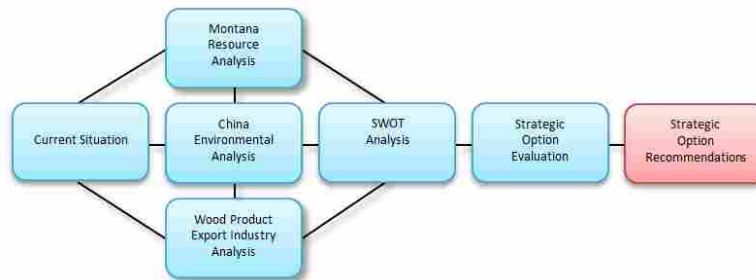
8.1 Chapter Objectives

The objective of this chapter is to provide an export strategy recommendation for Montana manufacturers. The first chapter objective is to present the recommended product marketing mix. The second objective is to recommend the geographic market segments that present the best potential for future product sales. The third objective is to recommend a target customer segment that can provide the best opportunity for future sales. The completion of these objectives will provide the needed export strategy recommendation that will be most beneficial for Montana wood product manufacturers.

8.2 Recommended Product Mix

The SWOT analysis conducted in chapter six recommended that Montana manufacturers should assume a strategic posture that primarily aggressively pursues dimensional lumber exports (2x4s) while employing a diversified product mix. Based on the strategic options assessed in chapter seven, it is recommended that six different 2x4 products be marketed to Chinese importers. These products are a mix of Douglas-fir, ponderosa pine, and lodgepole pine species, and are presented in Table 8.1.

Table 8.1: Recommended product offering

Product #	Species	Thickness	Width	Length	Surfacing
1	Douglas-fir	2"	4"	8' - 16'	SFS
2	Douglas-fir	2"	4"	8' - 16'	Rough
3	Ponderosa pine	2"	4"	8' - 16'	Rough
4	Ponderosa pine	2"	4"	8' - 16'	SFS
5	Lodgepole pine	2"	4"	8' - 16'	Rough
6	Lodgepole pine	2"	4"	8' - 16'	SFS

The strategic option product evaluation conducted in chapter seven provided three hierarchical lists of product types that provide the best fit with Chinese demand and Montana supply. The lists varied slightly depending on if the timber supply existed on National forest land, private land, or the total timberland in Montana. The general trend of these hierarchical lists displayed Douglas-fir products as having the best fit, followed by ponderosa pine and lodgepole pine. The Schedule B Codes associated with each product in this evaluation analysis provided a dimensional and surfacing description for each product. These descriptions are provided in Table 4.5. The products presented in Table 8.1 are arranged hierarchically by product number according to the best fit between Chinese demand and Montana's supply capabilities.

Information provided by industry specialists and presented in chapter section 4.6 revealed that 2x4s are the primary dimensions being utilized for real estate construction in China. Based on this information, all of the recommended products have nominal dimensions of 2" by 4". It should be noted that the strategic option product evaluation conducted in chapter seven had an additional Douglas-fir product code (DF-0154). However, the Schedule B Code descriptions indicate that the nominal dimensions for this product code are 2" by 2". For this recommendation, product type DF-0154 was not included in order to maintain a consistent 2x4 offering.

In chapter section 4.6, it was discussed that Chinese importers primarily purchase low grade 2x4s due to the interest in lower prices. Lumber being utilized for concrete forms is typically economy grade, while lumber being utilized for the furring strips can be economy grade or #2 or #3 structural light framing grades (Braden, 2012; Owen, 2012). Based on these factors, it is recommended that all six of the product presented in Table 8.1 be offered in these three grade categories. Essentially, this changes the recommended product offering to eighteen different product types. As was previously stated in chapter section 5.3, this market opportunity

is profitable for Montana mills based on a residual cash flow analysis utilizing 2011 average market and sales prices.

Other product factors that need to be considered are moisture content, wrapping, end trimming, edge easing, and grade stamping. The requirements of these product factors will likely vary between Chinese customers and should be discussed during negotiations. The moisture content will typically be below 19% for kiln dried dimensional lumber. The exact amount will depend upon the lumber grade and grading system utilized. All lumber that is exported is required to receive heat treatment in order to prevent the spread of harmful insects to other parts of the world. The grade stamp will typically read KD-HT for lumber that is kiln dried and heat treated (Leckey, 2007). Dimensional lumber being shipped overseas is typically paper or plastic wrapped to protect the lumber from the environmental elements. In some cases economy grade lumber is not wrapped due to the low value. Dimensional lumber typically receives double end trimming (DET) so that each piece of lumber receives a square end cut so that the length is at least as long as invoiced and less than 3" over invoiced length. In some cases precision end trimming (PET) is used so that lumber lengths vary by 1/16" in less than 20% of the pieces (Leckey, 2007). Edge easing refers to if the edges are purposely rounded to prevent splintering. Grade stamping is an inked marking placed on a piece of lumber that typically includes the mill identification number, name of grading agency, species, grade, and surfacing. When lumber is not grade stamped, mills typically provide a certificate of grade upon request of the buyer.

8.3 Recommended Geographic Segments

In chapter seven a geographic market analysis was done for determining locations where future housing development was likely to occur. These geographic segment scores are presented in a map of China in Figure 8.1. Each region has been given a color code in order to aid in identifying the best target market opportunities. Five of the regions received a matrix allocation score of nine or higher: Guangdong, Jiangsu, Shandong, Henan, and Hebei provinces. Based on this score, it is assumed that these provinces provide the best opportunity for future lumber demand. In chapter 4, a forecast was constructed that provided a prediction of future annual housing demand. The forecast for these five provinces is presented in Figure 8.1.

Figure 8.1: Chinese geographic market segment analysis map
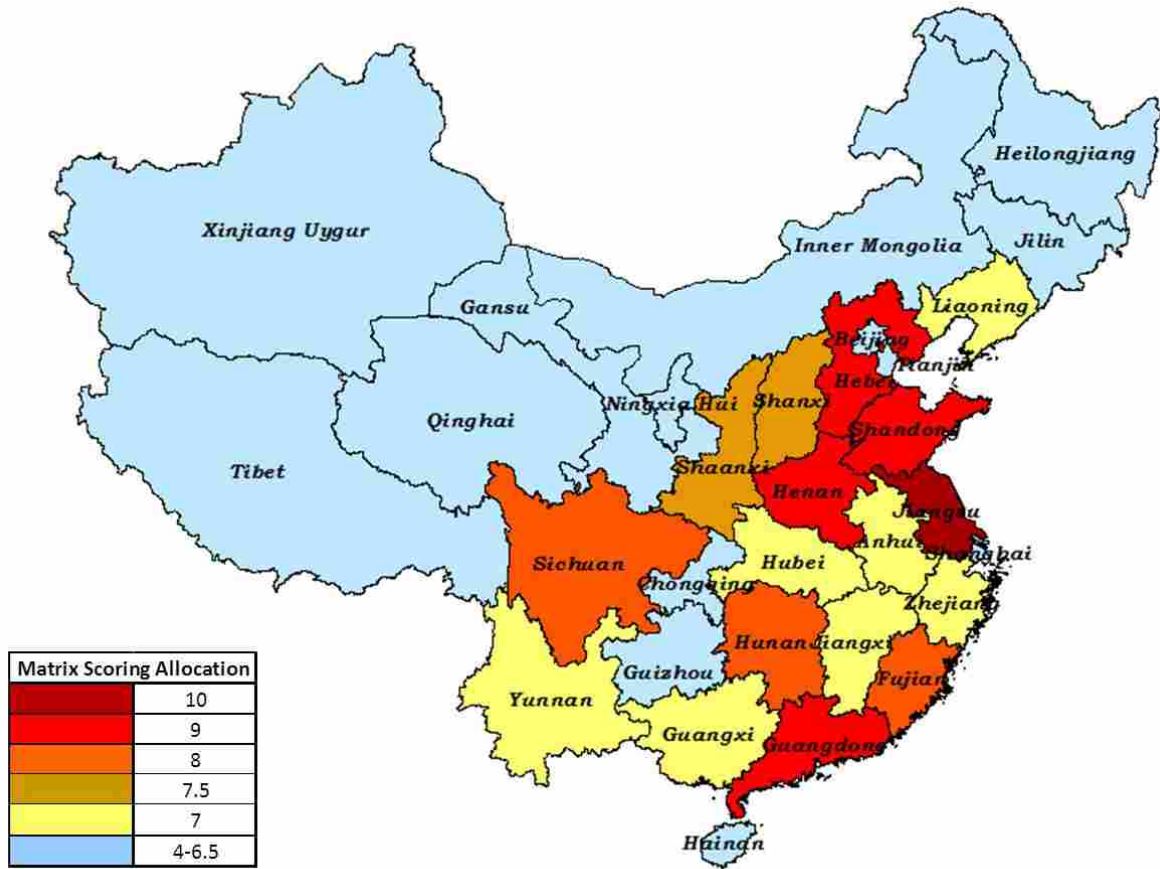
Figure 8.2: Forecasted housing unit demand by province
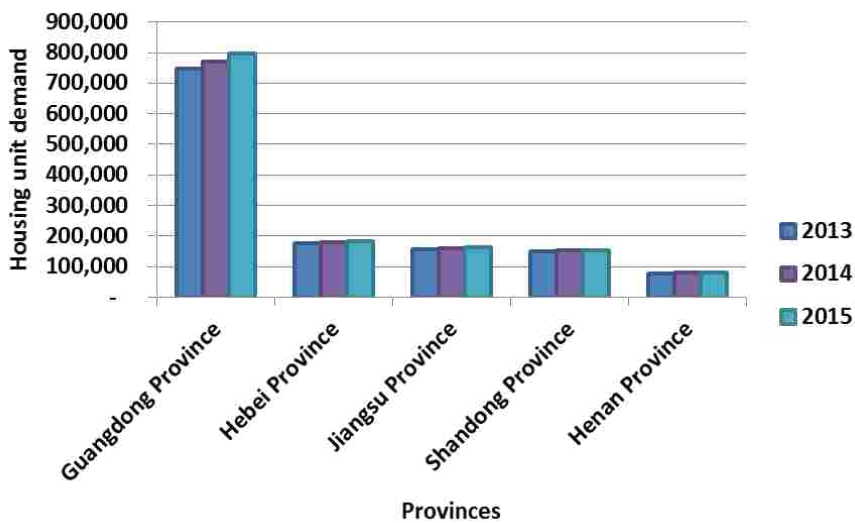
Source: NBSC, (2012).

When beginning a new business venture in China, it is highly recommended that a single market beachhead be established. Once market share foothold has been established at the beachhead market, the adjacent geographic possibilities will be easier to move into (Collins & Block, 2007). Choosing which market segment to utilize as a beachhead requires assessing expected demand opportunities, and expected competitive rivalry. Locations with the largest amount of demand may also have the largest amount of competitive saturation.

While the Guangdong province had largest expected future housing demand, it was not chosen as the beachhead location because Guangdong is the largest wood product manufacturing region in China (Petry, et al., 2010). This indicates that there will likely be a large amount of competition from Chinese manufacturers that have a competitive advantage of existing business relationships. The Hebei and Jiangsu provinces had the next highest levels of forecasted housing unit demand, but they were not chosen as the recommended beachhead market due to their proximity to the 1st tier Beijing and Shanghai municipalities. Market analysts believe that these two municipalities have been over built, which was discussed in chapter section 4.6. The geographic market analysis that was conducted in chapter seven also resulted in Beijing and Shanghai being located in the top ten lowest scores, which can be seen in Appendix A4. Furthermore, Shanghai is primary ocean port utilized by Canadian and U.S. wood product exporters (Braden, 2012), which may result in more intense competition in the cities of Hebei and Jiangsu that are nearer to Beijing and Shanghai.

Based on this analysis, it is recommended that the initial target market region be in the Shandong province. Shandong received a score of nine and is surrounded by three adjacent provinces that received scores of nine or higher. It should be noted that the final determination for a market beachhead should ultimately be decided after conducting an in-country assessment. The recommendation of this analysis is that Shandong be the focal point of the in-country assessment scope, with Hebei, Jiangsu, and Henan included on the scope perimeter. Within this scope, the recommended target locations are the smaller second and third tier cities. Second tier cities are approximately as developed and as wealthy as 1st tier cities like Beijing and Shanghai, but with smaller populations. Third tier cities are smaller cities that are in the early phases of economic growth and expansion (Collins & Block, 2007). Other factors that should be included in the assessment are distribution capabilities such as ocean port access and rail and major

highway locations. A map of the recommended geographic market scope along with major rail lines is presented in Figure 8.3.

Figure 8.3: Recommended geographic target market scope
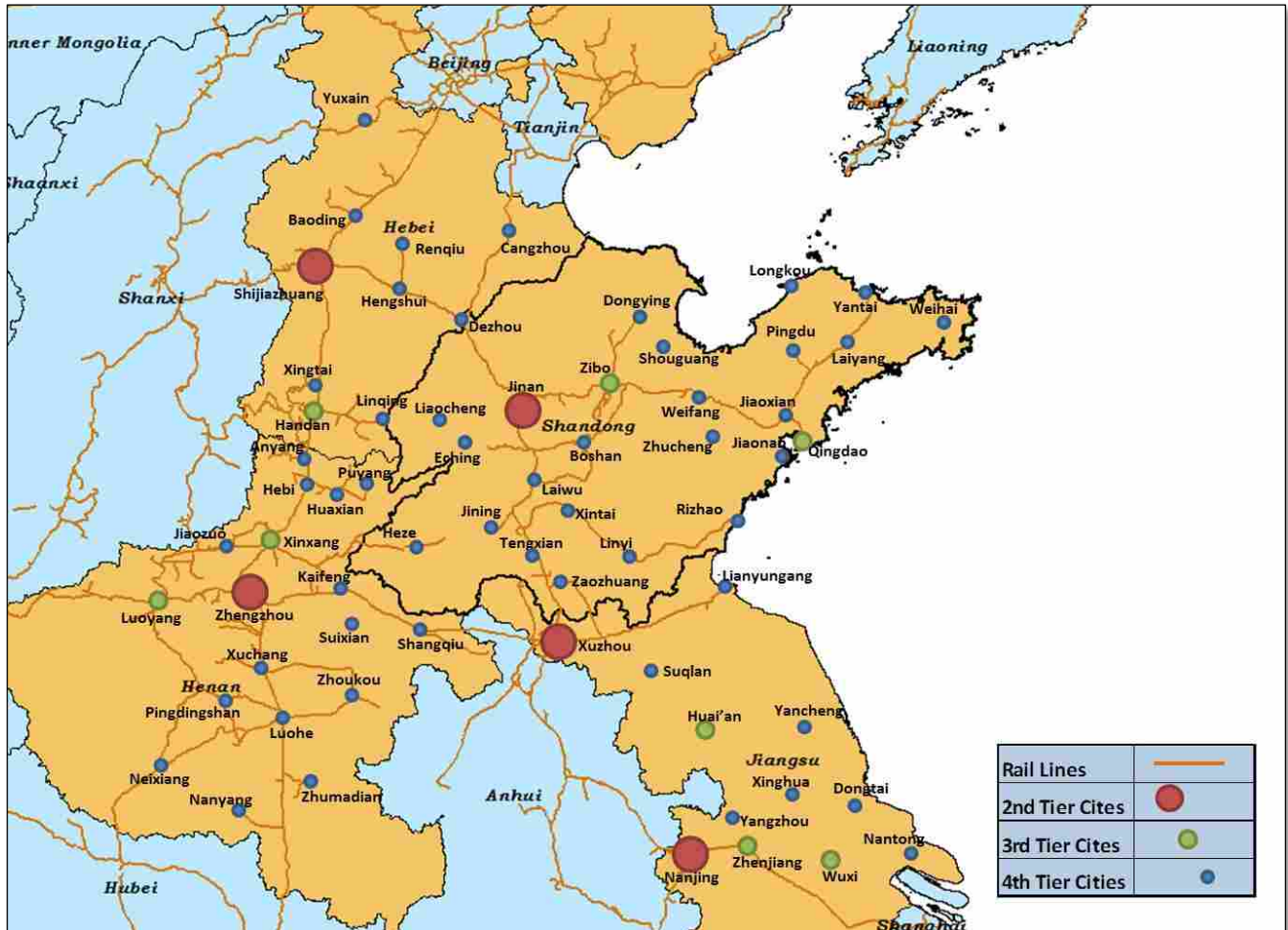
Note: Literature descriptions of 2nd, 3rd, and 4th tier cites are vague. This map represents city classification based upon province maps viewed at www.china-map-guide.com. City classifications of this map should be viewed only as a guide.

8.4 Target Customer Segment

For the targeted customer segment, it has been determined that the best potential customer group will be the smaller 2nd and 3rd tier wood product distributors. It is recommended that these distributors that exist in the identified 2nd and 3rd tier cites be the primary target market for Montana manufactures. The advantage for targeting this group is that they are likely to have

an established distribution network capable of serving the surrounding 3rd and 4th tier cities in their region. This group typically makes their purchases from larger 1st tier distributors in 1st tier cities (Cao, et al., 2006). By identifying a smaller distributor with a well-developed distribution network and providing comparable prices and improved service, it will be possible to establish a market beachhead. Once a market beachhead is established, it will be possible to grow into adjacent markets. The focus of this strategy is to avoid the large existing competitive rivalry in 1st tier cities while establishing market control in a smaller region with expected future demand.

8.5 Summary of Strategic Option Recommendations

The goal of this chapter was to provide a China export strategy recommendation for Montana wood product manufacturers. After completing this analysis, it has been decided that the best product mix that meets Chinese demand and fits with Montana's timber supply is a combination of six products of Douglas-fir, ponderosa pine, and lodgepole pine. The recommended geographic target market is for the 2nd and 3rd tier cities of the Shandong, Jiangsu, Hebei, and Henan provinces. It is suggested that Shandong be the focal point of this target market scope, with Jiangsu and Hebei on the periphery. The recommended customer segment is the smaller 2nd and 3rd tier distributors that serve the 2nd, 3rd, and fourth tier cites in this region. It is believed that this export strategy will provide the best opportunities for Montana wood product manufacturers. In order to further enhance these opportunities, best practice marketing techniques and mitigation strategies for potential threats are presented in chapter nine.

Chapter 9

Best Practices for Developing Export Opportunities in China &

Mitigations for Export Industry Threats

9.1 Chapter Objectives

The objectives of this chapter are to discuss marketing techniques and mitigation strategies that will help in increasing the future exports of Montana wood products. The first chapter objective is to describe the best practice marketing factors that will increase the value offered by Montana manufacturers in order to increase future sales to Chinese buyers. The second objective of this chapter is to present mitigation strategies that can ameliorate the threats of declining timber harvests in Montana. The third objective is to present an export coalition strategy for mitigating the strong competitive rivalry from other Pacific Northwest lumber manufacturers and to reduce the high shipping costs.

9.2 Best Practice Marketing Factors

Research on companies that have been successful at exporting wood products to China and other Asian countries has revealed five key success traits that should be utilized (Cao, et al., 2006; USCS, 2011; Holmes, et al., 2010; SEC, 2011; Collins & Block, 2007; Owen, 2012). These include a focus on building long-term relationships, adapting products to meet customer preferences, educating consumers on products, shortening distribution channels, and having an in-country presence. By focusing on these five traits, Montana manufacturers will have a better chance at developing their volume of exports.

Establishing long-term business relationships is the key for being a successful exporter to China (Cao, et al., 2006). Chinese companies have a strong respect for face to face meetings in order to develop a business relationship (USCS, 2011). It is often common for this process to take several months before a business contract is negotiated (USCS, 2011). In addition to building relationships with potential customers, it is also beneficial to have a strong working relationship with the government officials responsible for housing construction. Large portions of the housing projects are controlled by government agencies. Most if not all of the successful

building material exporters spend a great deal of time establishing contacts with these officials (Cao, et al., 2006).

The second trait that should be focused on is adapting products to customer preferences (Holmes, et al., 2010). This thesis has identified the current general preferences for imported softwood lumber. However, each regional market may have distinct variations in product use and desired product specifications. In any industry it is essential to make modifications so that they are adapted to meet the desired customs, tastes, and systems of the customer (USCS, 2011). A key to successful marketing is creating a value proposition that focuses on identified customer preferences and is presented in a fashion that strikes a chord with customers in such a way that they can see and experience the advantage. If value propositions are adjusted to meet the desires for each target market, a strong differentiation advantage can be gained over the competition.

The third best practice trait that should be followed is educating customers about the products offered (Cao, et al., 2006). This is the value proposition and includes explaining the different benefits that exists between different species, dimensions, product grades, and other differentiation factors. A survey conducted by the Softwood Export Council at the Interzum Wood Product Trade Show in Guangzhou, China, revealed that Chinese buyers would like to have access to more product price information and information on product grades (SEC, 2011). It is recommended that this product information be made available at initial meeting introductions and trade shows with marketing brochures/pamphlets. While many wood product manufacturers provide general brochures on their products, it has been found that brochures/pamphlets specifically developed for a target market are more effective (Holmes, et al., 2010). Professional photos and design that portray attractiveness and quality to the customer are essential (Holmes, et al., 2010). It should be understood that there are limits to the language proficiency of Chinese citizens. Care should be taken to make sure that all materials are written properly in the specified language (USCS, 2011). Furthermore, attention should be paid to the symbols and colors utilized in brochures/pamphlets. For example, the color white is associated with death or mourning and is predominantly used in funerals in the Chinese culture (Collins & Block, 2007). Other channels to share this information include trade journals, websites, and other online social media. For these channels, the same marketing guidelines are recommended. It should also be noted that while Google is the premier online search engine in the western world, Baidu is the premier search engine in China. If a website is created to assist in marketing,

it may be of value for Montana manufacturers to further research Baidu's pay for placement offerings.

The fourth trait that Montana manufacturers should strive for is shortening the distribution channels (Cao, et al., 2006). This means that manufacturers should try to bypass as many of the middle men in the distribution supply chain as possible. This will allow for Montana manufacturers to reduce the final cost of products to the end customers and allow for greater control in how the products are marketed. In addition, this will also allow for a greater understanding of customer product preferences.

The final best practice trait that has been found to increase success is having an in-country presence (Cao, et al., 2006). By having local representation in China, manufacturers will be better able to deal with distribution, logistics, and after-sales service. In regards to after-sales service, the two main drivers of service quality in terms of exceeding customer expectation are performance and responsiveness. By striving to out-perform competitors in customer service, service quality esthetics can be a further differentiation technique for Montana manufacturers (Holmes, et al., 2010). Customer service concerns are likely to vary between target markets, which enhances the importance of following up directly with past customers to ensure that their needs have been met (Holmes, et al., 2010). Having an in-country presence is also important for enhancing the other four best practices because it will allow for better relationship building, a greater understanding of customer preferences, the chance to increase customer education, and the opportunity to continually shorten distribution channels. Having an in-country presence can be done through a small sales office or company representative that frequents the China market. This is a trait that is being utilized by successful U.S. wood product exporters that have product sales in China and Japan (Owen, 2012).

By incorporating these five best practices, Montana wood product manufacturers should gain an advantage in exports to China. Once a target market has been established these five traits should continue to be implemented in order to maintain a competitive edge over rival exporters.

9.3 Mitigation Strategies for Timber Supply Threat

In chapter six, a SWOT analysis was conducted where it was revealed that Montana manufacturers are threatened by 64% of the potential timber supply being unavailable for export

production due to declining federal land timber harvests. This situation requires Montana manufacturers to take a defensive posture that improves weaknesses and avoids threats. Three mitigation strategies to this challenge have been identified, which are encouraging collaborative approaches to forest planning, increasing U.S. Congressional harvest mandates for the state of Montana, and adjusting U.S. Congressional legislation on the legislation of appeals and litigation of forest management decisions on National Forest land.

9.3.1 Collaborative forest management

During the last two decades, litigations against the Forest Service have been much more abundant, with a large portion occurring in Montana. This was discussed in section 5.4.1. While the Forest Service management decision process is designed to utilize the expertise of trained foresters, decisions appear to not be in sync with these environmental groups initiating these appeals. The high frequency of these appeals has resulted in the emergence of collaborative management planning methods.

Collaborative forest management is a process that involves bringing multiple group stakeholder representatives to a negotiation table in order to work together to reach consensus on management decisions that represent all stakeholder interests. An historic analysis of public conflict resolution has found that as the size of agrarian communities increased and personal relationships between all parties diminished, it was necessary for a political and legal system to be implemented to govern the controversies of a growing population. Now it seems that the population has grown too large for the political system to handle conflicts effectively (McKinney, 2011). The solution presented by collaborative management is a movement back to community style collaboration and values.

Techniques that have been found to be effective in achieving consensus within a group with diversified viewpoints include: learning about other stakeholder interests and needs before addressing a particular issue; sharing how each organization makes political decisions and the processes they use for negotiation; having participants report back to their organization after each negotiation session; and allowing for participants to share their organization's feedback at the next session (McKinney, 1997). Utilizing this process allows stakeholder members to gain a better understanding of the other member's values and a comprehension of why the conflict

exists. Once all values and interests are understood, it is possible for stakeholders to identify solutions that best meet all party interests. In some cases, concessions need to be made by party members to reach consensus, while other cases can result in solutions being identified that increase the total possible value gain for all parties.

In January 2007, the Montana Forest Restoration Committee was formed as a consensus-based collaboration group. The goal of this group is to restore Montana's National Forests through a collaborative process involving all of the major stakeholders. A set of 13 principals to guide the restoration work was created based on scientifically supported research, which is to be applied to the corresponding ecologically appropriate locations. The 13 principals include using an appropriate scale for treatments, project monitoring, reestablishing fire on the landscape, considering social constraints, engaging the community, enhancing the ecological systems, and enhancing education to build support for forest restoration (MFRC, 2012). As of October, 2012, the Montana Forest Restoration Committee has established four separate committees on the Bitterroot, Helena, Lolo, and Lincoln National Forests.

By continuing to support consensus based collaborative management, it seems likely that a reduction in the number of appeals against Forest Service management decisions can be achieved. While this process takes longer to reach implementation due to multiple stakeholder interests, outcomes can be achieved that allow for timber harvests to occur in accordance with the values of the local public. It is recommended that the best way to spur the collaborative management process is to increase Congressional harvest mandates. If Congress continues to pass mandates requiring annual harvest volume targets, it will be necessary for increased collaborative management in order to continue to meet the values and interests of the local public.

9.3.2 Increasing U.S. Congressional harvest mandates

In section 5.4.1, it was stated that the combination of fire suppression and the reduction of National Forest timber harvests has resulted in an overall decline in forest health. This is characterized by dense forest stands that are more susceptible to disease and insect attacks, as well as greater fuel accumulations that eventually result in increased fire severity and spread. With these types of conditions existing on National Forest lands today, management decisions

need to be implemented that can alleviate the forest fuel accumulations that increase the threat of poor forest health, severe wildland fires, and insect outbreaks.

The advantage of increasing Congressional harvest mandates is that management targets and deadlines are set by a recognized higher authority. By placing Congressional targets, Forest Service land managers will be forced to initiate collaborative management action. A recent example of a Congressional harvest mandate is Bill S. 268, introduced by Montana U.S. Senators Mr. Tester and Mr. Baucus. Bill S. 268 was released on February 3, 2011 and given the title, "Forest Jobs and Recreation Act of 2011." The purpose of this Act is:

(1) To preserve and create local jobs in rural communities that are located in or near National Forest System land;
(2) To create an immediate, predictable, and increased flow of wood fiber with commercial value to support and maintain locally based infrastructure and economies that are necessary for the appropriate management and restoration of National Forest System land;
(3) To promote collaboration in the management of National Forest System land;
(4) To restore and improve the ecological structure, composition, and function and the natural process of priority watersheds within the National Forest Systems;
(5) To carry out collaborative projects to reduce the risk of disturbances from fire, insects and disease to communities, watersheds, and natural resources through a collaborative process of planning, prioritizing, and implementing ecological restoration and hazardous fuel reduction projects,
(6) To collect information from the projects carried out under this title in an effort to better understand the manner in which to improve forest restoration and management activities (Tester, 2011).

The proposed Forest Jobs and Recreation Act of 2011 provided geographic locations and acreage targets for an annual basis and total project goals. In addition, management priority designation descriptions were given for high road density areas, wildland-urban interface locations, compromised fish and wildlife habitat connectivity areas, and forests at risk from insect epidemics and high-severity fires (Tester, 2011). The advantage of this Congressional harvest mandate is that it initiates a target goal structured at increasing wood flow to Montana wood product manufacturers by focusing on forest land in need of ecological improvement in order to reduce the future threat of insect epidemics, wildland fires, and other disturbances. In addition, it has the stated purpose of ensuring that management decisions at the local level be designed through the collaborative management process.

At this time, the proposed Forest Jobs and Recreation Act has been referred to the U.S. Senate Committee on Energy and Natural Resources for further review. Additional harvest mandates of this nature can provide the necessary future direction to ensure that forest management targets are provided and that on-the-ground forest management decisions are designed by all interested local stakeholders through the collaborative management process. However, even with an increased level of Congressional harvest mandates and collaborative management decisions, the threat of appeals against forest management decisions may not be resolved.

9.3.3 Altering U.S. Congressional forest management administrative appeal legislation

It has been recognized that despite the best efforts of collaborative management leaders in Montana, there still exists an environmental group faction that continues to initiate appeals against the Forest Service. A recent example is the Colt Summit restoration and fuels reduction project on the Lolo National Forest. Even though this project was designed through collaborative management by the Montana Forest Restoration Committee, there were three environmental groups that chose not to participate in the process even though they were invited several times (Altemus, 2012). Instead of working with other stakeholders to design a collaborative management plan, the Alliance for the Wild Rockies, Friends of the Wild Swan, and the Native Ecosystems Council made the decision to not participate and appealed the collaborative decision in 2011 (Altemus, 2012).

Despite the opportunity to collaborate with other stakeholders, it appears that these groups primary concern is to appeal management decisions whenever the recommended action is cutting trees. The challenge that this presents is that no amount of collaborative management or Congressional harvest mandates will be able to address this problem. The only solution to this problem is to address the nature of the appeal process itself.

This problem has already been brought to the attention of Congress by allegations that the appeals process has restricted the ability of the U.S. Forest Service and the Bureau of Land Management to manage the resources under their care. In 2011 Congress attempted to address this challenge by changing the Land Resources Management Plan review process in order to expedite the appeal process (Alexander, 2012). The goal of these alterations was to reduce the

time available to initiate an appeal and reduce the number of official reviewers in the process, while maintaining the 5th Amendment rights of the Constitution, which state that no person will be deprived of property without the due process of the law (Alexander, 2012). While these changes may increase the speed with which appeals can be processed, it does not address the challenge created by groups or individuals that are appealing all decisions that recommend the cutting of trees.

A potential mitigation to this challenge that has been suggested is to amend the Equal Access to Justice Act so that a cash bond is required for appeals and litigations against land management decisions. The Equal Access to Justice Act (5 U.S.C. § 504; 28 U.S.C. § 2412) authorizes the payment of attorney's fees to the prevailing party against the United States (SBA, 2012). The advantage of this Act for these environmental groups is that if they prevail they are rewarded by being compensated attorney fees, and if they lose they are only at loss for the cost of the number of hours spent. Anecdotal evidence suggests that, when these cookie-cutter style appeals are initiated for numerous management decisions that are similar in description, the cost for appeal operation is relatively low, which in turn can encourage numerous frivolous appeal operations regardless of what the proposed management decisions are. By requiring a cash bond for this type of appeals that is lost if the plaintiffs do not prevail, a check and balance system would be maintained, while discouraging numerous frivolous lawsuits. It would be expected that this would reduce the number of appeals against the Forest Service so that only issues of substance would be brought to attention.

The counter argument to this idea is that individuals with limited financial resources would not be able to provide a cash bond, which means that the power to fight what is perceived as injustices brought on by the government would be limited to only financially affluent people. This concern is valid and needs to be taken into careful consideration. The ongoing challenge in the future will be identifying the middle ground that will allow for all people to fairly oppose government decisions when they choose to, while preventing groups that seek to grind government management to a halt with numerous frivolous appeals and litigations.

In order to reduce the threat of the timber supply for Montana wood product manufacturers, it is recommended that pressure be continually put on Congress to adjust the appeal process laws to eliminate frivolous appeals without taking away the rights of individuals to oppose the government. This should be combined with pressure on Congress to increase

Congressional harvest mandates on National Forest lands by all groups and individuals interested in maintaining all aspects of Montana's forest industry infrastructure. Finally, support should continue to be given to building the collaborative management process so that science based forest management can be combined with social values at the local level.

9.4 Mitigation Strategies for Competitive Rivalry & High Shipping Costs

In chapter 5, it was discussed that one of the primary threats to Montana manufacturers seeking to export wood products to China is the high level of competitive rivalry. This rivalry exists from other manufacturers located in Idaho, Oregon, Washington, British Columbia, as well as manufacturers located in China. The two key factors that make this competitive rivalry such a strong threat is that Chinese buyers are known to be very price sensitive and Montana's geographic location creates an additional shipping cost that is not experienced by other competitors in the Pacific Northwest. In order to mitigate this threat, it is recommended that Montana wood product manufacturers form an export coalition.

9.4.1 Benefits gained with a Montana wood product export coalition

Research conducted by Roberts (2004), on trans-organizational systems revealed that the knowledge base and resources of individual organizations is often inadequate for challenging objectives. By sharing the knowledge base and resources of several organizations, a more effective response to particular problems can be found. Roberts stated that individual organizations possess specialized bodies of knowledge that allow them to provide goods and services to a market. A trans-organizational system allows a group of organizations to bridge these specialized bodies of knowledge between each other through shared power and dialogue. In business organizations, this system is typically referred to as a strategic alliance. By building an export coalition through a strategic alliance, Montana exports will be able to gain the specialized knowledge and resources that will allow increased export success.

The primary reasons cited for Montana wood product manufacturers not exporting more wood products is that they were not aware of which products were in demand and did not know how to build international business relationships (Rawlings, 2011). The formation of an export

coalition would allow manufacturers to work together with organizations to obtain the needed specialized knowledge, such as identifying wood products in demand in China, gaining the ability to initiate sales with Chinese companies, navigating the export regulations that need to be met, and creating shipping strategies that can reduce overall costs. Instead of each Montana manufacturer utilizing their own resources to gain this knowledge, resources could be pooled together and information could be shared between member organizations. Another advantage of a coalition approach to exporting wood products is that the manufacturing resource base could be combined in order to satisfy the demands of large Chinese import orders. By increasing the size of export orders, economies of scale can be realized in the rail and ocean shipments, resulting in a lower sales price per cubic foot sold. In addition, the leveraged powers of a coalition of Montana manufacturers would be better suited in negotiating shipping rates with rail companies that already possess monopoly-like powers. The total export strength of the Montana wood products industry and the individual mill sales that would be achieved by Montana wood product manufacturers if they formed an export coalition is much larger than if each manufacturer attempted to take on this challenge by themselves.

The primary reason cited for Montana manufacturers not utilizing this approach was the fear that it would violate anti-trust laws and individual companies could end up facing impending lawsuits (Hayes, 2011). The three core anti-trust laws are the 1890 Sherman Act, the 1914 Federal Trade Commission Act, and the Clayton Act. The basic objective of these laws is to protect the process of competition for the benefit of the consumer (FTC, 2012). With strong penalties for violating the anti-trust laws, it is understandable that Montana wood product manufacturers have not assumed a coalition strategy approach before. However, there is a solution to this problem that allows for an export coalition to exist without violating the anti-trust laws.

9.4.2 Export Trading Company advantage

In 1982 the Export Trading Company (ETC) Act was enacted by Congress in order to increase the export competiveness of small and medium size businesses in the U.S. It had been recognized that many American businesses were not able sell their products at the international level due to lack of knowledge on international markets and financial capital limitations. This

act was designed to eliminate the hurdles faced by these companies by eliminating the inability of companies to cooperate with other U.S. firms due to antitrust restrictions, reducing the risk that would occur for individual companies, and provide new financing mechanisms (DoC, 1987).

Title III of the Act provides for the issuance of export trade certificates of review from the Secretary of Commerce, which allows the export conduct of any person to receive antitrust protection. Title IV clarifies the jurisdictional reach of the Sherman Act and Federal Trade Commission Act in relation to commerce (DoC, 1987). Once an export trade certificate is approved by the Secretary of Commerce, member organizations listed under the export trade certificate are protected from the anti-trust laws so that they may work together to increase their combined exports. The anti-trust immunity applies to these organizations as long as their combined efforts are only for exports and not for sales into the domestic market.

In addition to gaining the opportunity to work together towards increasing exports, gaining additional customers, and potentially lengthening of production schedules, member organizations also receive risk reduction benefits. Risk reduction primarily occurs when the ETC takes title to the goods to be exported from the member organizations. The ETC then assumes all responsibility for the goods until title is transported to the foreign buyer (DoC, 1987). By eliminating the risks experienced by individual companies and shifting it to the ETC, member organizations can focus their attention to product manufacturing rather than dealing with the multiple level of international risk associated with exports.

In order to provide the necessary working capital for ETCs to take title to the goods of multiple manufacturers, financial mechanisms were incorporated into the ETC Act. Title II of the ETC Act permits banks and Bank Holding Companies (BHC) to invest in an ETC in order to provide working capital loan guarantees from the Export-Import (Ex-Im) Bank[7]. There are several requirements for banks and BHCs that wish to invest in an ETC. First, the maximum amount of equity that banks BHCs can invest is 5% of their capital and surplus. Second, extensions of credit to an ETC cannot exceed 10% of their capital and surplus. Finally, the bank or BHC is generally subject to the collateral requirements in the Federal Reserve Act for loans to the ETC (DoC, 1997). If the bank or BHC is a lending partner with the U.S. Export Import Bank, the working capital loans provided by these lenders will receive a 90% loan backing

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[7] The Export-Import Bank of the United States was established in 1934 and is the official export credit agency of the United States federal government. The mission of the Bank is to create and sustain U.S. jobs by financing sales of U.S. exports to international buyers.

guarantee from the U.S. Export Import Bank. These financial mechanisms can provide an advantage to Montana wood product manufacturers because risk is shifted to the ETC, which is financed by a bank or BHC with equity ownership, which is provided with financial insurance from the U.S. Export Import Bank (DoC, 1987). Basically, individual companies gain the advantage of anti-trust protection in order to increase their exports, while the U.S. Export Import Bank assumes a majority share of the financial risk.

The Export Trading Company Guidebook drafted by the U.S. Department of Commerce provides 5 potential ETC models. The Trade Stream Model presented in this guidebook presents an ideal model for a Montana wood product export coalition. In this model, the four groups containing the necessary specialized resources or knowledge assume Board of Directors positions. These include a bank or BHC for the necessary working capital requirements, a freight forwarder to arrange shipping logistics, a representative from the wood product manufacturer member organizations to ensure that manufacturer member interests are met, and a market specialist of the targeted international markets. This combination export knowledge and resources would provide the required elements to ensure the success of increased exports. Additional positions included in the Trade Steam Model include the President, the Vice President of Finance, the Vice President of Marketing, and the Executive Secretary/ Administrative Assistant. This model is presented in Figure 9.1.

The advantages of forming an export coalition for Montana manufactures includes the compilation of required resources, shared market knowledge, and the advantage of achieving larger sale orders and reduced shipping costs per unit due to economies of scale. By organizing this group as an export trading company, members of the coalition can be protected from the anti-trust laws and experience a reduction in export risk through loan guarantees provided by the U.S. Export Import Bank.

Figure 9.1: Export trading company Trade Stream Model for a Montana wood product export coalition
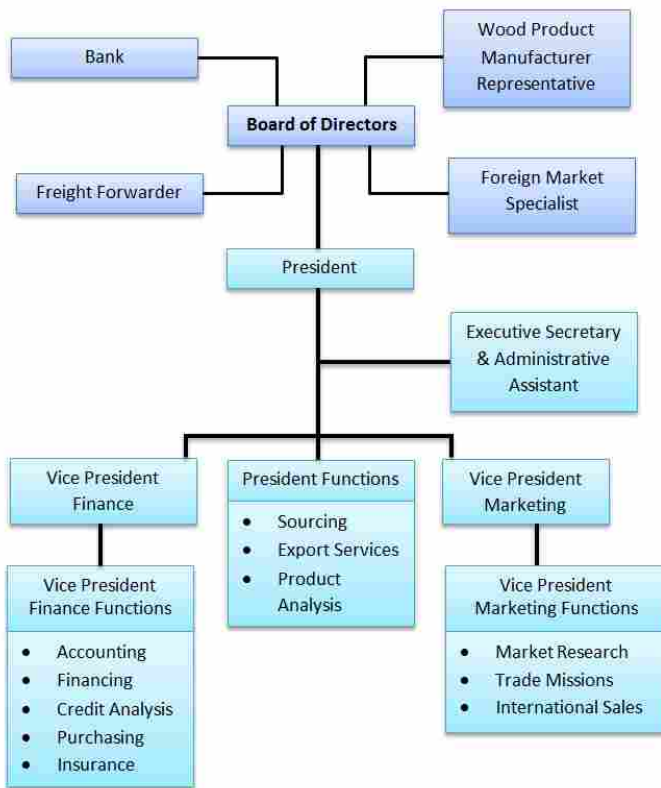
Source: DoC, (1987).

9.5 Summary of Best Practices & Threat Mitigations

In this chapter, multiple recommendations were provided in order to share export best practices with Montana wood product manufacturers, as well as provide potential mitigation strategies for the timber supply threat and the threats of high competitive rivalry and high shipping costs. The five key success traits for export success include having a focus of building long-term relationships, adapting products to meet customer preferences, educating consumers on products, shortening distribution channels, and having an in-country presence. In order to mitigate the timber supply threat it is recommended that pressure be put on Congress to alter legislation in order to reduce frivolous appeals and lawsuits against federal land managers and to also increase the level of Congressional harvest mandates. In addition, it is recommended that collaborative management processes continue to be utilized in order to further incorporate social values in the planning process. In order to mitigate the threat of competitive rivalry and high shipping costs, it is recommended that an export coalition be formed as a licensed export trading

company in order to gain the advantages of legal protection, financial assistance and risk reduction. The combination of these best practices and mitigations should assure export success for Montana wood product manufacturers.

Chapter 10

Conclusion

The goal of this research thesis was to identify strategic options for exporting Montana wood products to China by utilizing the strategic formulation process presented by De Kluyver, (2012). This process identified the primary resource competencies possessed by Montana's forest industry and linked them to Chinese wood product demand opportunities that provided the best fit. The motivation for this research is due to the declining production levels of Montana wood product manufacturers, which are struggling to survive the low levels of domestic demand. By identifying new markets to diversify product sales, wood product manufacturers would have a chance to increase their production levels.

The research methods of this thesis focused on identifying export options that would provide the largest opportunity for Montana manufacturers. These methods identified the net potential harvestable volumes of timber, the potential manufacturing capacity of Montana mills, the available distribution capacity, and the demand volume of Chinese importers.

Upon completing the strategic formulation process, it was found that the Montana wood products that provided the best fit with Chinese import demands were dimensional lumber (2x4s) of Douglas-fir, ponderosa pine, and lodgepole pine. This recommendation represents the products that have the largest potential supply in Montana that correspond with the largest current demand in China. It was recommended that these products be marketed to Chinese importers with S4S surfacing or no surfacing. The grades of these products that are currently in demand are economy, light structural #2, and light structural #3. A residual cash flow analysis comparing 2011 average market prices, shipping costs, and sales prices revealed that this is a feasible opportunity for Montana mills. The recommended target markets that Montana wood product manufacturers should pursue are the 2nd and 3rd tier lumber distributors that are located in the 2nd and 3rd tier cites of Shandong province. It is believed that this market provides the opportunity for future growth, while presently having lower competition from industry rivals.

The combination of the net potential harvestable volume of Montana timber, the additional available manufacturing capacity of Montana mills, the additional available distribution capacity, and the Chinese lumber import demand allows for the identification of the size of this export opportunity. This is presented in Figure 10.1.

Figure 10.1 Comparison of Montana's sustainable supply capacity & China's 2011 lumber import demand
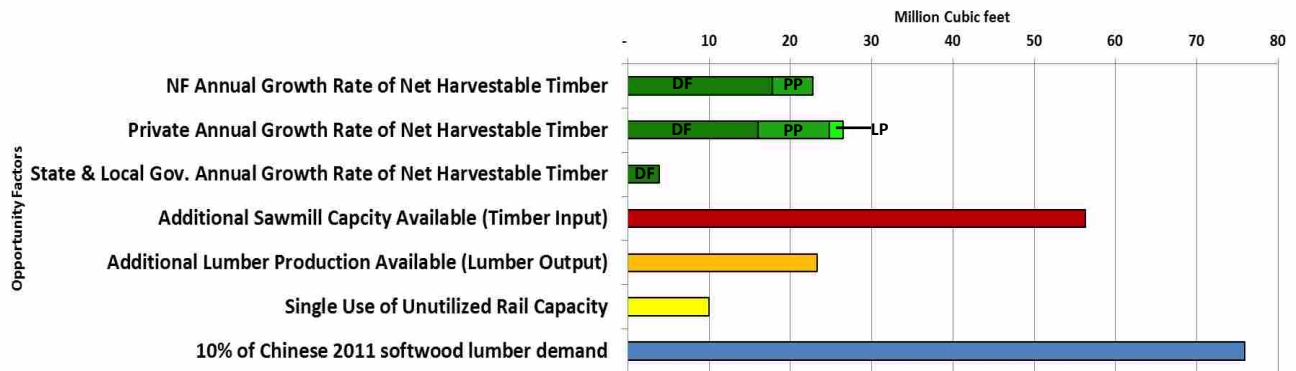
The top three bars in Figure 10.1 represent the annual growth rate of the net harvestable volume of Douglas-fir, ponderosa pine, and lodgepole pine. This annual growth rate refers to the total annual growth, minus average annual mortality, and annual harvest removals. The combined of annual growth volume from the three ownership classes presented, represents 95% of the additional available capacity (Timber inputs) of Montana's sawmills. The amount of lumber that could be produced from the additional available capacity of Montana's sawmills is 23.3 MMCF. The blue bar at the bottom of Figure 10.1 represents 10% of China's 2011 lumber import demand. Montana's additional available lumber production capacity of 23.3 MMCF represents just 2.9% of China's 2011 lumber import demand, an amount that grew by 43.6% from the previous year. With the addition of the unutilized rail capacity, this export strategy presents a large sales opportunity that could allow Montana manufacturers to dramatically increase their wood production. In addition, given the relatively small amount of lumber volume that Montana can supply and the rapid growth in China, it seems that Montana could enter the Chinese market with little displacement of other suppliers.

Even though this export strategy presents a large opportunity to increase Montana's wood product production, several challenges exist due to the high levels of competitive rivalry and high shipping costs. To mitigate these challenges, it was found that the best option is for Montana manufacturers to develop an export coalition, formed as a licensed export trading company in order to gain the advantages of legal protection, financial assistance and risk reduction. With the formation of an export coalition, resources can be shared to develop a Montana wood product presence in China, focused on building long-term trade relationships. A

unified "Montana Wood" brand, adapted to meet Chinese customer preferences presents the best opportunity to increase the overall export benefits for Montana's wood product industry.

Additional challenges exist for this export strategy in regards to declining timber harvest levels on National Forest land. The best short-term mitigation strategy requires a focused collaborative management processes in order to further incorporate social values in the forest management process and limit the number of management decision appeals. The best long-term strategies for mitigating declining timber harvest levels requires a focus on the Federal Congress to alter legislation in order to reduce frivolous appeals and lawsuits against federal land managers and to increase the level of Congressional harvest mandates.

The export strategy developed in this research thesis provides a chance for the Montana forest industry to increase production much closer to capacity. By putting this strategy into action, wood product sales can be diversified into a new market, manufacturing production can increase, and new forest industry jobs can be created. This strategy provides a plan for Montana manufacturers in regards to target products and markets in China.

The primary limitation of this research was that it was not possible to visit the recommended Chinese target market in person. Further in-country research is needed on the existing distributors in this target market, the size range of orders they typically make, and specific product preferences. With this research, more in depth data could be provided to manufacturers in order to reduce the inherent risk associated with conducting trades in international markets. While this opportunity was determined to be financially feasible when utilizing 2011 average market prices, shipping costs, and mill sales prices, the level of profitability may decline as the U.S. housing market begins to recover. An additional challenge of this research was the process of converting board foot volumes to cubic feet. For this process, the best available conversion factors were utilized as was explained in section 1.4, but it was not possible to get an exact conversion. If U.S. manufacturers were to make a switch to metric measurements, it would be possible to have more precise data to analyze.

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Appendix A
Lumber and Panel Product Descriptions

The two categories of products that are manufactured from saw and veneer logs are lumber and panels. The four primary types of lumber products manufactured are dimensional lumber, boards, timber, and factory/industrial. Dimensional lumber mainly refers to lumber with a nominal thickness of two inches. Boards mainly refer to lumber with a nominal thickness of one inch. Timbers have a nominal thickness of five inches and greater. Factory/industrial refers to lumber cut up to make products such as doors, window parts, mouldings, and furniture (Leckey, 2007). Research conducted by (Spoelma, et al., 2008), concluded that 77% of the lumber produced in Montana is dimensional lumber, with boards, timbers, and factory/industrial products making up the remainder.

The two categories of panel products that are manufactured are structural and non-structural panels. Structural panels are used for applications that require a certain measure of strength or stiffness, with the primary application being residential construction. The two primary types of structural panels produced are plywood and oriented strand board (OSB). Plywood is made from sheets of veneer that are peeled from logs. The cut to size veneer sheets are stacked in cross-laminated piles, glued together with a bonding agent, and then pressed under heat and pressure to complete the final product. OSB is made in the same process as plywood, but instead of veneer sheets, the layers are made from wood strands or flakes. Non-structural panels are primarily used for applications that don't require a large amount of strength, such as cabinets, furniture, crates, and boxes. The three primary non-structural products are particleboard, hardboard, and medium density fiberboard (MDF). Particle board is manufactured by assembling a mat of individual wood particles that are then coated in adhesive resin and pressed together into a finished panel. Hardboard and MDF are a dry-processed fiberboard manufactured from wood fibers that provide a higher level and more uniform density that veneer or particle board. The wood fibers are cured under heat and pressure to complete the finished panel (Leckey, 2007).

In addition to the various types of lumber and panel products, the end products are sorted by species, dimensions (Thickness, width, and length), the grade or quality, the moisture content, surfacing, edge easing, and end trimming (Leckey, 2007). All of these factors have an impact on

the time for production and the final price of the end product.   The types of panel products that are produced in Montana are plywood, particle board, and MDF.

Appendix B

Forest Sustainability Certifications

In this thesis, it was presented that there are four Montana mills that are independent third party certified for sustainable forest practices. The three types of certification include forest management, fiber sourcing, and chain of custody. Forest management certification entails that a forest area in sustainably managed according to set of management requirements. Fiber sourcing certification ensures that the wood product fiber is obtained from a sustainably managed forest. Chain of custody certification is a record keeping process that provides evidence that the finished product was sustainably managed and harvested along every step of the supply chain. The certification systems utilized by the four Montana mills are the Sustainable Forest Initiative (SFI), American Tree Farm, and requirements set by the California Air Resources Board (CARB).

The SFI forest certification system encompasses three systems that include forest certification, chain of custody certification, and certified sourcing. The forest certification system is used to promote responsible forestry practices. The land management standards require that fourteen objectives be met in order to qualify according to the 2010-2014 standards. The chain of custody certification is an accounting system that tracks the wood fiber through the entire supply chain. This allows for companies to claim how much of their products come from officially certified lands. The certified sourcing system was designed to address the large portion of the world's forests that are not certified. Under this program, parties are required to show that wood fiber came from legal and responsible sources (SFI, 2012).

The American Tree Farm certification ensures that the timber from a tree farm system was managed and harvested under an established set of standards and guidelines. This system was established by the American Forest Foundation, which utilized an independent panel of experts from academia, conservation organizations, federal and state governments, landowners and foresters to design the management standards. It includes eight standards that must be met according to the 2010-2015 standards (ATFS, 2012).

CARB is responsible for monitoring regulations of California's 35 air districts. In 1992 for formaldehyde was designated as a toxic air contaminant in California, which required

CARB to take action to reduce human exposure to potential formaldehyde emissions (CARB, 2012).

Appendix C
Transportation Methods for Shipping Wood Products

The two types of truck transportation utilized for lumber products are flatbed trucks and truck vans. Flatbed trucks are basically large flat platforms pulled by an over the road truck tractor. These trucks can haul any type of unitized lumber. Truck vans have a deck size that is equivalent to over the road truck trailers, but have the addition of side-walls, a top, and a front. Flatbed trucks can generally carry 23 to 25 tons (Leckey, 2007). Truck vans can generally carry 21.5 to 22 tons. The advantages of shipping by flatbed trucks are speed, convenience, competition, accessibility, price for shorter hauls less than 1,000 miles, and ease of loading for flatbed trucks. The disadvantages of shipping by flatbed trucks are price for hauls over 1,000 miles, the possibility of negligent truck drivers, and tarping problems (Leckey, 2007).

The three types of rail cars that are utilized for lumber transportation are boxcars, bulkhead flat cars, and center beam flatcars. Boxcars are fully enclosed rail cars that have sliding doors on each side for loading and unloading. The typical size load for a rail boxcar of lumber is 4,080 to 4,200 CF. If a dense packing method is used, the load size can be increased to 4,920 to 5,040 CF. This requires mixed sized units in order max out the full capacity of the boxcars (Leckey, 2007). Bulkhead flatcars are flat railcars with vertical flat walls at each end of the car. A 56' bulkhead flatcar will typically carry 4,800 to 5,100 CF of dimensional lumber (Leckey, 2007). Center beam flatcars have a solid divider running down the length of the car. The holding capacity for a 73'4" center beam car is approximately 100 tons, which translates to a capacity range of 5,520 MBF to 7,080 MBF of dimensional lumber (Leckey, 2007).

The advantages of shipping by rail are cheaper costs when exceeding 1,000 to 1,500 miles, greater efficiency with large loads, and ease of loading on flat cars. The disadvantages of shipping by rail are slow speeds, the supplier and buyer need to be located near a rail siding, and the difficulty of loading for boxcars. Rail companies typically encourage shippers to be billed on weight based rates in order to load as much weight as possible. The measurement is "hundredweights" (CWT) and is terminology for 100 pounds. Instead of weighing each rail car filled by a mill, random sample cars are taken to determine an average weight per cubic foot. By increasing the amount of lumber or overall weight per railcar, the shipping rate per cubic feet is lowered. This savings, translates into an increase on the lumber trade profit.

The third shipping option is through the utilization of containers (Multiple mode). These are also referred to as Vans or Piggybacks. In this process, a container is brought to the supplier's location by truck. Once it is loaded, it is driven to a rail-side, where the container is taken off the truck and transferred on to a flatbed rail car. The advantages of container shipping are weather protection, price when compared to truck rates, and versatility. The disadvantages include loading challenges, price when compared to rail rates, slower speeds when compared to trucks, and less volume than flatbed trucks. Container length sizes vary from 20 ft., 40 ft., and 53 ft. (Lewis, 2012).

Appendix D12

Five Forces Analysis

Appendix D contains the complete five forces analysis that was conducted in chapter five. The purpose of this analysis was to assess the primary threats faced by Montana wood product manufacturers when exporting their products to China. This analysis was performed by utilizing the methods outlined by Porter, (2008). The force groups that were assessed are the threat of entry, the power of suppliers, the power of buyers, the threat of substitutes, and the threat of rivalry from existing participants.

D.1 Threat of Entry Analysis

An analysis on the threat of entry is focused on identifying the level of ease for new entrants to move into an industry. The geographic scope of this analysis was for the states of Montana, Idaho, Oregon, and Washington, and the province of British Columbia. If it is determined that the ease of entry is high, the level of competiveness in that industry increases. The purpose of this analysis is to score the six barrier to entry components that were identified by Porter (De Kluyver, 2012). These scores are presented in Figure D.1.

Figure D.1: Threat of new entrants scoring analysis
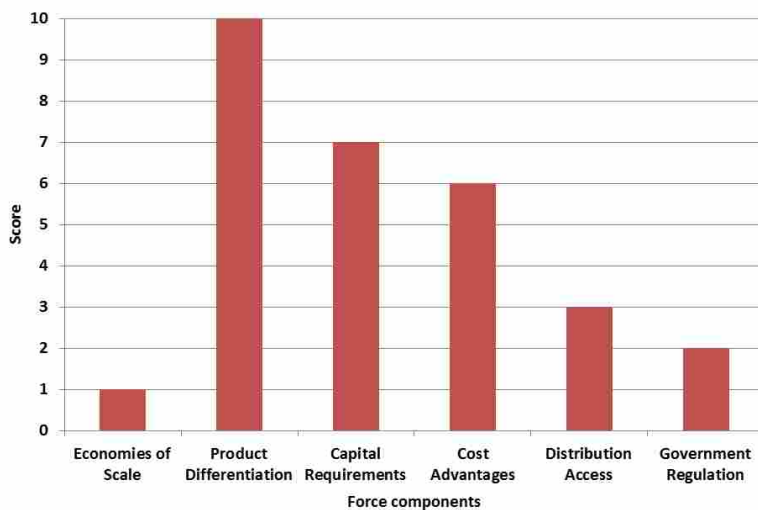
D.1.1 Economies of scale

The first barrier of entry is economies of scale and refers to a lower cost of unit production as the scale of output is increased. Greater economies of scale create a higher difficulty for new entrants into an industry. Through an analysis of the history of lumber production in Montana, it is obvious that economies of scale exist. According to McIver, et al., (2012), in 1956 there were 307 lumber mills in Montana with an annual lumber production of less than 2,750,110 CF, representing 92% of the lumber mills in the state. The production of these smaller mills represented 33% of the total lumber production in Montana. In the same year there were 26 mills that each produced more than 2.7 million CF on an annual basis, and represented 67% of the total production. In 2009 there were 30 lumber mills with an annual production of less than 2.7 million CF, which represented 73% of the number of mills in Montana. Their production represented 2% of the total lumber production in Montana. In the same year there were 11 mills that each produced more than 2.7 million CF on an annual basis, and represented 98% of the total production. This historic trend indicates that mills that had a greater output production level were able to take a larger portion of the market over time. In 1981 the average processing capacity for lumber mills in Montana was 2.3 million CF and in 2009 the average processing capacity of lumber mills was 3.3 million CF (McIver, et al., 2012). While the total number of mills has declined during the last few decades, the production capacity of the surviving mills has increased. The fact that larger mills control a majority share of the total production and the average capacity of mill production is rising while the number of total mills is decreasing indicates that strong economies of scale exist in this industry. Based on these findings, the threat of new entrants to this industry based on economies of scale is low and is given a score of 1.

D.1.2 Product differentiation

In regards to product differentiation, there are relatively few product options in lumber and panel production. Individual companies primarily achieve differentiation through altering the grade, dimension size, edging, surfacing, and packaging of the products produced (Leckey, 2007). Companies choose how they want to differentiate their products based on the markets that they would like to serve. Industry grading standards in the U.S. create an environment that

allows for products of the same species and type to appear to be the same even though they are produced by different manufacturers. Due to the fact that product are easy to mimic by other companies, the threat of new entrants to this industry based on differentiation is considered high and is given a score of 10.

D.1.3 Capital requirements

The capital requirements for establishing a lumber or panel mill are generally quite large. While these amounts differ by the size of the mill, production capacity, and technology used, the average cost for establishment is in the millions of dollars. Wood product industry statistics collected by Piwowarski (2004), provide the U.S. average establishment cost and average annual payroll cost for sawmills, plywood/veneer mills, and reconstituted wood product mills (Particle board & MDF). These estimates were based on data provided by 4,403 sawmills, 155 plywood/veneer mills, and 317 reconstituted wood product manufacturers. The most recent average cost estimates collected by Piwowarski (2004), for wood product manufacturing were 1997 statistics. These numbers were converted to 2012 dollar values by using a consumer price index calculator from (USBLS, 2012), and are presented in Table D.1. While these costs are high enough to deter most individuals from establishing a mill, the costs are quite small when compared to the costs required to establish new developments of coal, oil, or natural gas. If the establishment of a mill was considered to be profitable, meeting these capital requirements would not be difficult for a large corporation or group of affluent individuals. Based on the establishment costs and annual payroll costs, the threat of new entrants to this industry is considered moderate to high and given a score of 7.

Table D.1: Average 1997 cost for wood product manufacturing facilities

Mill Type	Establishment Costs	Annual Payroll
Sawmill	$ 5,290,837	$ 1,029,266
Plywood/Veneer	$ 36,471,890	$ 8,411,060
Reconstituted Wood Product	$ 13,512,073	$ 3,599,820

Source: Piwowarski (2004) and adjusted to 2012 dollars with the USBLS (2012) CPI calculator.

D.1.4 Cost advantages

In some industries, it is possible for entrenched companies to have cost advantages over new entrants regardless of size or production capacity of new entrants (De Kluyver, 2000). In regards to the forest products industry, the two primary cost advantages that can occur are lower costs for raw timber supply and a geographic location that allows for lower shipment costs. Lower raw timber supply costs would occur if the wood product manufacturers were vertically integrated and owned a large portion of timber land. This could allow them to have a lower procurement cost for raw timber than competitors that did not own their own timberland. Vertically integrated forest product companies were historically the standard corporate model in the forest industry. During the last decade, this dynamic has changed with institutional investor groups owning the majority of private timberland. This change was driven by a need for the former vertically integrated companies to seek more tax-efficient ownership structures and therefore divesting their timberland ownership. The current majority owners of private timberland are Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs) (Bliss, Kelly, & Abrams, 2008). Due to the tax incentives of moving away from a vertically integrated structure, raw material cost advantages for existing U.S. mills are not as strong as they used to be.

However, cost advantages do exist for Canadian lumber mills. The Canadian timber pricing model provides timber to mills at rates that allow for wood processing profit allowance (Spelter, 2006). In contrast, U.S. timber pricing is based on the published market rate deemed through transactional evidence or what log buyers believe their competition will pay. This method does not always allow U.S. mills to procure timber at rates as low as their Canadian counterparts. The Canadian timber industry has acknowledged that their timber pricing model gives them a competitive advantage over U.S. mills, which increases the threat of cost advantage for U.S. mills. The challenge for new Canadian sawmills to establish themselves in British Columbia is not known, but if new establishments do occur in this region, Montana lumber mills will be at a disadvantage due to Canada's timber pricing model.

Geographic location benefits occur for mills when they are located in close proximity the raw timber supplies and the markets for their finished products. Land owners are more likely to sell their timber to the closest mill in order to increase stumpage price. It is also beneficial for manufacturers to be near the market they serve or in close proximity to modern distribution

routes like rail lines and large highways. The wood products industry has existed for a long time, which means that the most ideal locations for manufacturers are generally taken. This factor will make it more challenging for new entrants to achieve this cost advantage. Based on these factors, it is determined that the threat of new entrants based on cost advantages of existing mills is moderate and given a score of 6. While the threat of new entrants based on cost advantages is low in the U.S., the Canadian timber pricing model cost advantage creates an environment that may allow for the entrance of new Canadian mills to be able to provide lumber at lower costs than existing Montana mills.

D.1.5 Access to distribution channels

As was discussed in Chapter three, the primary lumber and panel distribution methods are by truck and rail. The costs for arranging shipping for both truck and rail are generally an equal fee, based on distance of travel (Leckey, 2007). In circumstances involving large shipments a lower shipment cost per unit can be realized due to economies of scale. Since domestic demand for wood products is currently low due to the decline in new housing starts, there is a large amount of unutilized distribution capacity for both truck and rail (Lewis, 2012). For shipments of longer distances, rail presents a lower cost per unit (Leckey, 2007). New entrants to the wood products industry may find themselves at a disadvantage because many of the existing mills are already located on a rail line or have established a rail siding. In order to gain access to rail shipping, new entrants may have to ship their lumber by truck to a rail siding or establish their own rail siding. Both options represent an additional cost to new entrants. Based on these circumstances, the threat to new entrants based on access to distribution is considered low and given a score of 3.

D.1.6 Government regulation

Government regulations that affect the wood products industry are primarily based on employee safety. Sawmill employment is considered one of the most dangerous occupations in the United States due to the hazards of log sizes and weights, sawing equipment, and respiratory diseases from wood dust and chemical applications. The Occupational Safety and Health

Administration (OSHA) has created specific industry standards that outline mill design, personal protective equipment requirements, respiratory protection requirements, handling and storing methods, hand and power tool operation, and process safety management (OSHA, 2012). Designing a new wood product mill to meet these requirements represents a challenge that new industry entrants will have to abide by in order to operate legally. Because of the dangers to employees and the industry operational standards to mitigate these dangers, the threat of new entrants based on government regulations is considered relatively low and given a score of 2.

D.2 Power of Suppliers

The power of suppliers is an important factor to consider because control of the raw material supply can influence prices, quantity sold, and overall demand (De Kluyver, 2000). A scoring analysis of the five components that make up supplier power is presented in Figure D.2.

Figure D.2: Supplier power scoring analysis
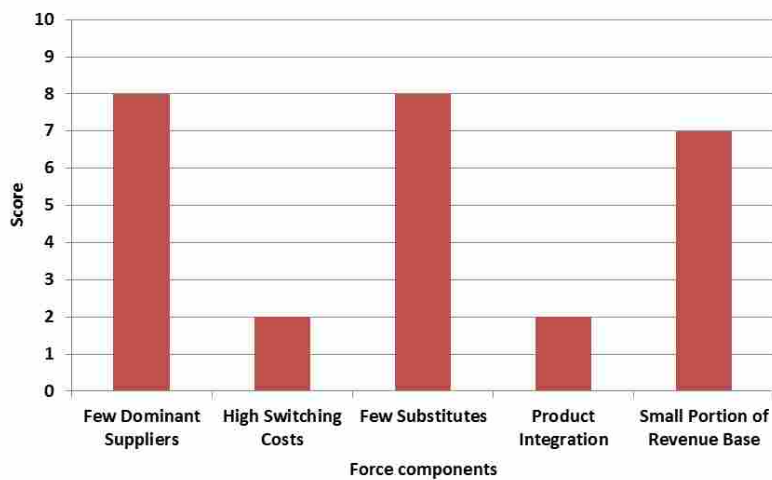
D.2.1 Few dominant suppliers

The first component that increases supplier power is if there are few dominant suppliers. Based on the Chapter three analysis of timber volume in Montana that is available to harvest, there is a total of 2.9 billion cubic feet of timber distributed between Douglas-fir, lodgepole pine, ponderosa pine, western larch, and Engelmann spruce (IW-FIA, 2009). Of this amount, 64%

exists on National Forest land and 30% exists on private land, with the remaining portions on other federal land and state & local government land. The 30% private land portion is distributed between industrial and non-industrial private owners, making the supplier power less concentrated. However, the 64% ownership existing on National Forest land represents a very concentrated supplier base. In addition, the amount of timber harvest that is occurring on National Forest land has severely declined during the last two decades. In 2011, the total timber harvest on National Forest land was approximately 25% of the amounts that were harvested between 1989 and 1991 (Morgan, et al., 2012). The reasons for this decline in harvests have been attributed to changing public preferences with regards to logging on public land, internal management challenges that can be expected with a large bureaucracy such as the Forest Service, and external challenges from appeals and lawsuits directed at proposed Forest Service projects (Hayes, 2011).

In order to understand the root cause of the timber supply threat in Montana, it is necessary to understand the historical forest management decisions regarding timber harvests. The initial forest management procedures were based on European management practices. European forests were intensively managed due to their decreasing size caused by centuries of expanding human populations. In order to maximize output, all wildland fires were seen as a negative factor for forest management. When the 1910 fire burned over three million acres in Idaho and Montana, fire suppression efforts were exercised at a maximum level (Lewis, 2005). The removal of this natural process resulted in the occurrence of denser forest stands overtime. These denser stands resulted in a decreased level of available nutrients, which caused an overall decline in forest health. Stands became more susceptible to disease and insect attacks. In addition, the greater fuel accumulations eventually resulted in larger wildland fires that exhibited more extreme behavior (Arno & Fiedler, 2005).

The middle of the 20th century was when the greatest amount of timber harvest occurred on National Forests. At this time there was a growing need for lumber supplies to meeting expanding urban housing developments. Harvest practices were generally designed to maximize efficiency and minimize total costs (Lewis, 2005). In the 1960s and 1970s there began to be a change in the public opinion of how the National Forests should be managed. Greater values were place on recreation, aesthetics, wildlife habitat, and overall ecosystem health. Environmentally focused groups believed that the Multiple Use and Sustained Yield Act of 1960

would not cause the Forest Service to view timber extraction on par with other forest uses (Rasband, Salzman, & Squillace, 2009). These views were compounded when the Bolle Report was released in 1970, criticizing the Forest Service for failing to promote true multiple use management in regards to clear-cutting harvests in the Bitterroot National Forest (Rasband, et al., 2009)). Alterations to forest management policy were passed by Congress in 1974 with the Forest and rangelands Renewable Resources Planning Act, which required the Forest Service to prepare resource management plans. Additional reform was added in 1976 when Congress passed the National Forest Management Act. The congressional intent of these Acts was to create a planning process that would involve scientific expertise while combining social values through public participation (Rasband, et al., 2009). In order to continually challenge forest service decisions numerous appeals have been filed by environmental groups and individuals.

According to a publication by Simpson (2012), between 2006 and 2008 the national appeal average against mechanical thinning and logging in the seven USFS forest regions was 18% per region. During this time period Montana received 40% of the appeals. Simpson (2012), stated that the three environmental groups primarily responsible for these appeals are The Alliance for the Wild Rockies, the Native Ecosystems Council, and the Wild West Institute. Between 2006 and 2008 these three groups represented 28%, 24%, and 10% of the total appeals filed nationwide. Since 2005, 545 appeals have been filed in Region 1 against the Forest Service for NEPA decisions related to specific projects or NEPA decisions related to the development and amendment of regional guidelines and land resource management plans (Griffith, 2012). Of these 545 appeals, only 53 of them have resulted in the Forest Service withdrawing decisions or Forest Service decisions being partially or fully overturned (Griffith, 2012). When Forest Service decisions are overturned or withdrawn, the harvest or fuel reduction treatments that were planned to take place are cancelled.

Advantages for environmental groups in utilizing the appeal or litigation process include the relatively low cost of initiating the process, the chance to earn a seat at the negotiation table, the empowerment a group or individual can gain by obstructing a large agency, and the chance to have management decisions overturned (McKinney, 2011).

The disadvantage to the Forest Service is that there is a high cost for project delays to conduct additional analyses before being able to move forward. An online ad sponsored by RY Timber Inc. and supported by other western Montana mills: (1) Pyramid Mountain Lumber Inc.;

(2) F.H. Stoltze Land & Lumber Company Inc.; (3) Roseburg Forest Products; (4) Sun Mountain Lumber Company; (5) Tricon Timber LLC, states that these frivolous administrative appeals and lawsuits has resulted in a steady decline in timber sales on federal lands and as a result, Montana lumber mills are not able to obtain enough logs to operate at an efficient level (RY-Timber, 2010). This belief is also shared by members of the Montana Wood Products Association (Altemus, 2012), and Montana forestry consultants (Rawlings, 2011). Based on these findings, it is believed that the primary root cause of the decline in Montana's timber supply is the high frequency of appeals against Forest Service management decisions.

An additional supplier group that needs to be considered is the supply of shipping logistics. While there are numerous truck companies that can provide shipping services to Montana manufacturers, the two primary rail service providers to west coast ocean ports are Burlington Northern Santa Fe (BNSF) and Montana Rail Link (MRL). MRL rails lines serve many of the manufacturers in western Montana and a BNSF line serves the manufactures located in northwest Montana. The MRL rail line eventually connects to BNSF in Idaho, with the existing service to Washington ports being entirely BNSF. This control of the market share allows BNSF a considerable amount of leverage in setting the shipment costs for Montana manufacturers. Negotiating lower rates is only possible if consistent large shipments can be arranged (Lewis, 2012). Based on the fact that timber ownership National Forest lands represents 64% of the total, the declining harvest on National Forests due to numerous litigations, and the large amount of shipping leverage possessed by BNSF, the threat of supplier power is considered high and given a score of 8.

D.2.2 High switching costs

The second factor that can contribute to supplier power, is if the components supplied are differentiated, therefore making the cost of switching suppliers high. In the wood products industry, the only differentiations among raw timber are the species type and size class. As was discussed in Chapter three, small diameter lodgepole pine, Douglas-fir, and ponderosa pine have the largest supply abundance in Montana. Douglas-fir and ponderosa pine are relatively evenly distributed between private ownership and National Forest ownership. However, small diameter lodgepole pine predominantly exists on National Forest land. Despite this uneven distribution of

ownership, supplier switching costs is not considered to be high because product manufacturing is not solely dependent on the utilization of just one species. The score given for this component is 2.

D.2.3 Few substitutes

The third factor that makes up the supplier power is base is minimal supply substitutes. For the production of wood products, manufacturers are dependent on the supply of logs from timberland. A decline in the harvest of timber directly affects the amount of products that can be produced. While it is possible for manufacturers to purchase raw timber supplies from other regions, the available supply is dictated by the distance of travel. Increased distances make supply procurement costs un-economical. Because there are no substitutes for logs, the score is considered moderate to high and given a score of 8.

D.2.4 Supplier production integration

The fourth component of the supplier power base is if suppliers can integrate forward and produce the products themselves. Historically, this was the corporate model for forest product companies. However, as was previously discussed, forest product companies have been moving away from vertical structure integration due to tax incentives (Bliss, et al., 2008). Based on this recent trend, it is unlikely that timberland owners will integrate forward and produce wood products at a capacity level that could be a threat to existing mills. Small landowners can purchase portable sawmill equipment, but the capacity and inventory levels of these sawmills is quite small when compared to the leading manufacturers. The threat of this factor is considered low and given a score of 2.

D.2.5 Industry comprises small portion of supplier revenue base

The final component of the supplier power base is determining if the wood products industry purchases of raw timber represent a small portion of the supplier's revenue base. In regards to timberland existing on National Forest land, the supplier revenue base is dominated by

budget allocations from the federal government. As long as tax payer dollars continue to flow into Forest Service budgets, the purchases of raw timber from National Forest land will continue to represent a small portion of the revenue base. In regards to timberland existing on private ownership, the recent ownership trend alterations may also be problematic. As was previously discussed, institutional investors have recently become majority ownership of private timberland (Bliss, et al., 2008). While these institutional investors may continue to utilize their timber holdings for log production, they may be inclined to convert and or fragment the marginal timber growing lands for the sale and production of recreational or residential real estate. This fragmentation of timberland is referred to as "Highest and best use" (HBU) designation by institutional investors (Bliss, et al., 2008). HBU land purchases are also being designated for conservation easement purchases. In these conversion situations the ecological value of a land segment is considered more valuable than log production for wood products. Conservation oriented entities such as land trusts, conservation organizations, and local communities are the primary buyers for this type of HBU conversion. Based on these factors, it is determined that revenues generated from log purchases by wood product manufacturers represent a shrinking portion of private suppliers and a very minimal portion National Forest suppliers. These factors create an increase in the supplier power base and a score of 7 has been given.

D.3 Power of Buyers

The power of buyers is addressed because a large amount of power can allow buyers to exert an influence on the price of wood products, the demand, and the amount sold (De Kluyver, 2000). A scoring analysis of the four factors that make up buyer power is presented in Figure D.3.

Figure D.3: Buyer power scoring analysis
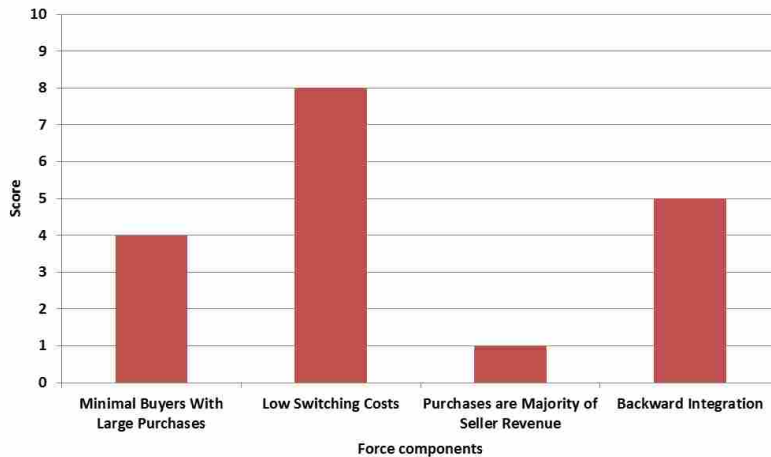
D.3.1 Minimal buyers

The first factor than can make buyers more powerful is if there is a small amount of them and they buy in large volume (De Kluyver, 2000). Approximately 30% of China's wood product imports are represented by a handful of large manufacturers, wholesalers, and distributors. The remaining 60% of the import market is represented by a large army of small-scale wholesalers and distributors (Braden, 2012). Chinese wood product importers are known for large orders. A survey of 26 Chinese importers revealed that the import sizes can have a broad range. Twenty-four wood product importers were interviewed by the Softwood Export Council at a 2011 trade show in Guangzhou, China (SEC, 2011). This information was complimented with monthly import size data on two Chinese companies, received in an interview with (Braden, 2012). An analysis of the data reveals that the average monthly import size for a single Chinese wood product importer is 21,420 CF. The maximum size reported was 283,200 CF, while the minimum size was 360 CF. With a median size of 2,640 CF, it appears that the range in size of orders can vary substantially. Based on the fact that 60% of the import market is made up of many small-scale importers and that purchase range can vary from hundreds of thousand cubic feet to several hundred cubic feet, the power of buyers in regards to this component is deemed to be moderate. A score of 4 was given.

D.3.2 Low buyer switching costs

The second factor that can give buyers significant power is if the products purchased represent low differentiation, making it easy for them to switch suppliers. In the case of lumber and panel products, differentiation is primarily based on grade, dimension, surfacing, edge easing, and packaging (Leckey, 2007). This makes it easy for other mills to mimic a popular product type. Because of this attribute, it is determined that buyer power in this category is relatively high, and score of 8 was given.

D.3.3 Buyer's purchases represent the majority of seller's revenue

The third factor that gives buyers a large amount of power is if their purchases represent a sizeable portion of the seller's revenue. In the case of U.S. wood products, Chinese purchases have historically not represented a large portion of American wood product manufacturer revenue. In 2011, just 8% of China's total softwood lumber imports came from the U.S. (Flynn, 2011). This amount is also much larger than previous years. According to data collected by the Department of Transportation, U.S. wood product exports to Asia in 2010 represented less than 1% of the total wood product production in the U.S. for that year (FAF, 2011). In addition, it has not been found that any of the primary lumber mills in Montana are primarily dependent on the Chinese market. Based on these factors, it is deemed that the buyer power in regards to portion of the seller's revenue is low and is given a score of 1.

**D.3.4 Buyer's ability to integrate backward**

The final component that can give buyers power is if they are able to integrate backward and produce the products themselves. In regards to wood product production technology, China is well behind the U.S. and Canada (Owen, 2012). However, the Chinese have an advantage in a large workforce that receives much lower wages than employees in North America. By utilizing their advantage of a low-cost workforce, China is able to produce their own lumber by importing logs and applying a portion of this workforce to work in low-technology mills (Owen, 2012). The evidence of this trend can be seen in the size of the country's log imports. In 2011, China's log imports nearly reached 1 billion cubic feet (Flynn, 2011). In addition, China has an

advantage in that when entrepreneurs do decide to establish modern lumber mills, they will be comparable in technology with the U.S. and Canada in a much shorter time than it took North American lumber mills to get to the capacity levels that they have today. This is an advantage that exists for late industry movers because they do not have to expend large amounts of capital to research potential innovation technologies. Based on these factors, it is considered that Chinese buyer power is currently moderate in regards to their ability to integrate backward. A score of 5 is given.

D.4 Substitute Products & Services

Substitute products are addressed because they have the potential to remove market share from existing businesses (De Kluyver, 2000). In China the primary method for housing construction is through the use of concrete. The largest use of wood products is the utilization of wood studs for the construction of concrete forms and furring strips that are used to attach interior drywall to the concrete walls (Owen, 2012). Potential substitutes for the wood studs could include steel studs or studs made from wood-plastic composites. A scoring analysis for the two components that make up the threat of substitutes is presented in Figure D.4.

Figure D.4: Threat of substitute products scoring analysis
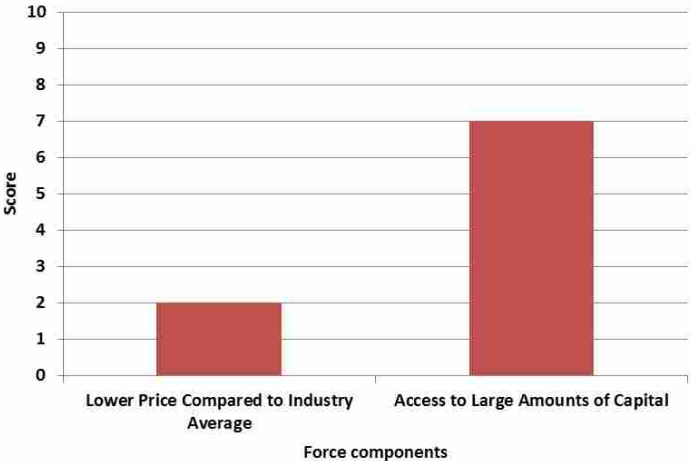
D.4.1 Lower price in relation to industry average

The first factor identified by (Porter, 2008) for determining the threat level of substitutes is price performance relative to the industry average. This factor is important to assess because Chinese wood product purchasers are known to be very price sensitive (Braden, 2012). In regards to concrete form construction and furring strips, the potential advantages of steel studs include strength and stability, non-shrinking or warping properties, manufactured to exact order specifications, non-combustible in fire, pre-punched holes for electrical and plumbing installation, and potential for recycling (Scafco, 2009). The advantages of wood-plastic composites over wood are weather resistant properties, longevity, and manufactured to exact specifications (Perth, 2012). At this time price comparison of wood studs to steel and wood plastic composites is not known. Because Chinese buyers are known to be price sensitive, it is assumed that the wood studs currently being imported have a lower cost. However, it is possible that lower costs for steel and wood plastic composite studs could be achieved in the future through greater production and economies of scale or it may be possible that the advantages achieved from using substitutes may be more cost productive in the long-run. Because of these possibilities, the first component for threat of substitutes is currently considered low and given a score of 2, but this threat of substitutes should be continually assessed.

**D.4.2 Companies have large production capacity**

The second factor for identifying the threat of substitutes is determining if the companies producing the substitutes have large capital resources and are capable of capturing a large market share through sheer volume of production. In order to make this determination, industry ratios were collected for the U.S. from (D&B, 2011) to get an estimate of the current assets that could be compared between lumber, steel, and wood plastic composite manufacturers. In 2010, of 30 steel mill establishments that were surveyed, the average total current assets were $76,535,077. The average cash portion of these current assets was $13,244,077. For the same year 253 lumber manufacturers were surveyed, in which the average total current assets were $1,506,157, with the average cash portion of the current assets being $358,117. Information on wood plastic composites was not available. These figures indicate that the average capital resources of steel manufactures are much more substantial than the average capital resources of lumber

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manufacturers. If the production cost of steel studs reached a point that was comparable to wood studs, the potential for market share takeover is high. The score for this factor is 7.

D.5 Rivalry Among Participants

The competitiveness of an industry is largely determined by the rivalry among participants. A scoring analysis for the five factors that make up competitive rivalry is presented in Figure D.5.

Figure D.5: Threat of industry rivalry scoring analysis
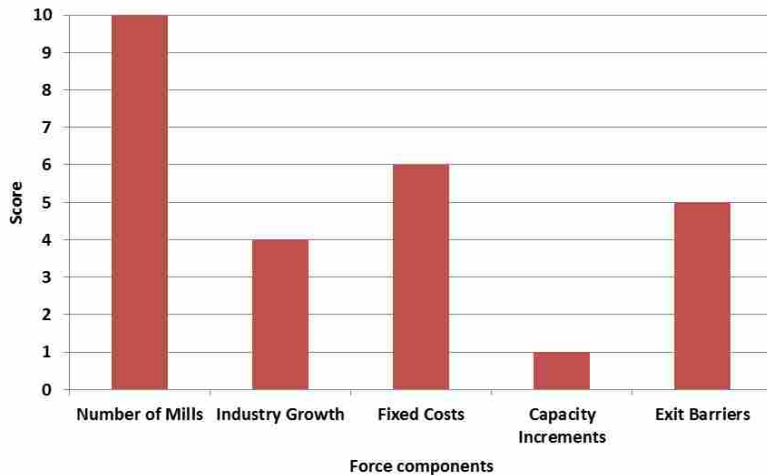
D.5.1: Number of mills

The first factor in determining rivalry is if the number of competitors are numerous and relatively equal in size and power. In 2011, the U.S. had a small share of the wood product import market to China. The market was primarily dominated by Canada and Russia, followed predominantly by countries in northern Europe, and then the U.S. (Flynn, 2011). In order to determine the level of competition that exist for Montana mills in regards to the 8% U.S. market share and 45% Canadian market share, mill statistics were generated from the RandomLengths (2012a) mill directory. This information is presented in Figure D.6.

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Figure D.6: Comparison of wood product manufacturers by state/province & product
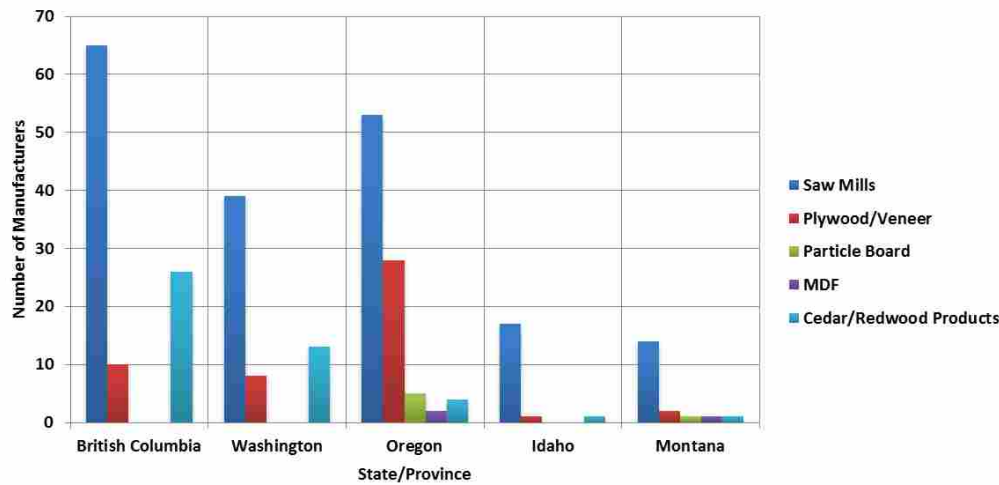
As can be seen in Figure D.6, British Columbia has the largest amount of sawmills, which most likely represent the majority of Canada's 45% market share. The 8% U.S. share is largely dominated by sawmills in Oregon and Washington, that have a cost advantage over mills in Idaho and Montana due to closer proximity to ocean ports (Owen, 2012; Braden, 2012). In regards to plywood/veneer mills, Oregon represents the largest amount of potential competition for Montana, followed by British Columbia and Washington. In regards to particle board and MDF, Oregon represents the only competition for Montana. Among these four state/province competitors, Montana represents 7% of the total sawmills, 4% of the plywood/veneer mills, 17% of the particle board mills, and 33% of the MDF mills. In addition, it has been found that Canadian mills have a competitive advantage over U.S. mills due to the fact that their timber pricing model incorporates a wood processing profit allowance (Spelter, 2006). Based on large number of mills in competition with Montana mills and the competitive advantage possessed by Canadian mills, the threat of rivalry for this component is considered high and given a score of 10.

D.5.2 Industry growth

The second component that determines competitive rivalry is if industry growth is slow and competitors are fighting over market share rather that looking for new customers. While the

size of the U.S. wood product market is declining due to low domestic housing starts, wood product imports in China have been consistently rising for the last few years (SEC, 2012). However, there is the possibility that Chinese buyers will prefer to continue importing products from known buyers. With Canada commanding a majority share of this export market, market share gains for Montana firms could be challenging. Based on this factor, competitive rivalry is considered moderate and given a score of 4.

D.5.3 Fixed costs

The third component that can increase competitive rivalry is if fixed costs for production are high. High fixed costs require the manufacturer to produce and sell a larger amount of their product in order to break even. This creates a more competitive environment because each participant needs to produce and sell large volumes in order to stay operational. Fixed costs in the wood product industry are largely determined by the size of the mill operation. For larger production mills, fixed costs can be large due to the amounts of energy required to operate the equipment, the large amounts of energy required to heat the lumber kilns, and high loan payments on equipment. Because of the expected high fixed costs for larger capacity mills, which control a majority portion of the total market, this factor is considered to be moderate to high and given a score of 6.

D.5.4 Capacity increments

The fourth component that can increase industry rivalry is if capacity increases can only be achieved through large increments. As was discussed in chapter two, Montana lumber mills are operating at approximately 47% (Section 3.5), of their potential capacity (McIver, et al., 2012). Increasing the current level of capacity requires increasing the number 8 hour shifts. These increments are small when compared to the cost of expanding a mill that is already operating at full capacity. Because capacity can currently be increased through small increments and mills are operating on average at less than 50% of their potential, this factor is considered to represent low competitive rivalry. A score of 1 was given.

D.5.5 Exit barriers

The final factor that can increase industry rivalry is if the exit barriers are high for discontinuing operations. In regards to the wood products industry, it is assumed that exit barriers are moderately high due to the large establishment costs to start a mill make it necessary for investors to seek a strong return on their investment. Exiting the industry represents a large potential loss for these investors. Based on this factor, a score of 5 was given.

D.6 Summary of Export Industry Assessment

After analyzing each of the five forces, the total matrix scores for each force were tallied and presented as a percent of the maximum potential score. This is presented in Figure D.7.

Figure D.7: Scoring analysis of 5 forces threats
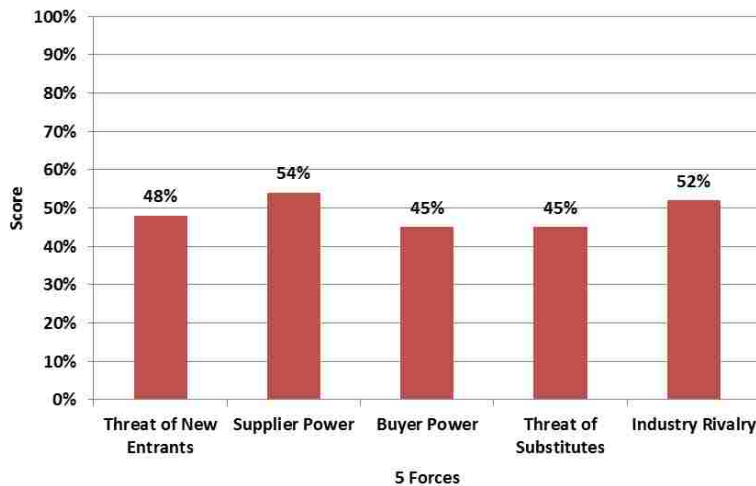
The threat of supplier power had the largest percentage score at 54% and was considered a moderate threat. The components that create the largest supplier power threats are that there are no substitutes for raw timber for wood product manufacturing, the Forest Service controls the largest portion of available timberland and has a declining trend of timber harvest, and that the timberland owners are not solely dependent on sales of logs for revenue. The threat of industry rivalry had the second largest percentage at 52%. The factors of industry rivalry that present the strongest threats are that there a large number of competitive participants, fixed costs for mills are relatively high, and the exit barriers are high. Buyer power, substitute products, and new

entrants were also considered a moderate threat. The factor of buyer power that represents the greatest threat is that buyers have low switching costs due to the fact that wood products have low levels of differentiation. The factor of substitutes that represents the largest is threat is that steel studs represent a potential substitute and steel manufacturers have access to a large amount of capital when compared to lumber manufacturers The components that represented the greatest threat for new entry was low product differentiation, moderate capital requirements when compared to establishing coal, oil, or natural gas establishments, and the competitive advantage gained by Canadian mills due to the Canadian timber pricing model.

This analysis of the potential threats for exporting wood products to China makes it possible to identify which threats present the greatest potential challenge for Montana manufactures. By knowing which threats represent the greatest challenge, it is possible to identify mitigations and potential opportunities that are unrealized by other competitors. Mitigation strategies to these threats will be presented in chapter nine.

Appendix E

Hierarchy of Chinese provinces and municipalities for expected future housing construction

Region	Population Score	Job Creation Score	Total
Jiangsu Province	4	6	10
Guangdong Province	5	4	9
Hebei Province	4	5	9
Henan Province	4	5	9
Shandong Province	4	5	9
Fujian Province	3	5	8
Hunan Province	3	5	8
Sichuan Province	3	5	8
Shaanxi Province	3	4.5	7.5
Shanxi Province	3	4.5	7.5
Anhui Province	2	5	7
Guangxi Zhuang	3	4	7
Hubei Province	2	5	7
Inner Mongolia	2	5	7
Jiangxi Province	3	4	7
Liaoning Province	3	4	7
Tianjin Municipality	3	4	7
Yunnan Province	3	4	7
Zhejiang Province	4	3	7
Beijing Municipality	4	2.5	6.5
Heilongjiang Province	3	3	6
Jilin Province	2	4	6
Qinghai Province	2	4	6
Shanghai Municipality	4	2	6
Tibet	2	4	6
Chongqing Municipality	1	4	5
Gansu Province	1	4	5
Guizhou Province	1	4	5
Hainan Province	2	2	4