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Measuring the Perception of Scarcity of the Veneer Log
Resource in the Lake States, Illinois, and Indiana

presented by

Micheal McGuire

has been accepted towards fulfillment
of the requirements for

Master of Science degree in Forestry


Major professor

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**MEASURING THE PERCEPTION OF SCARCITY OF THE VENEER LOG
RESOURCE IN THE LAKE STATES, ILLINOIS, AND INDIANA**

By

Michael McGuire

A DISSERTATION

Submitted to
Michigan State University
In partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Forestry

2000

UMI Number: 1401152



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ABSTRACT

MEASURING THE PERCEPTION OF SCARCITY OF THE VENEER LOG RESOURCE IN THE LAKE STATES, ILLINOIS, AND INDIANA

By

Michael McGuire

Forest Industry professionals have expressed concern about physical scarcity and diminishing quality in veneer logs of the preferred species' contradicting USDA Forest Service inventory results which report an expanding resource base. This study examined factors influencing economic supply of select white oak, select red oak, hard maple, ash, black cherry, and black walnut veneer logs in the Lake States, Illinois, and Indiana. Increased competition due to international demand is placing additional pressure on available inventory. Changing demographics are acting to reduce supply as non-timber land uses increase in importance. Industry professionals were queried to quantify their perception of scarcity and determine which factors they consider most important. The dominant perception is that quality is decreasing. Profitable architectural and panel grade veneer logs are perceived to be diminishing while furniture grade veneer logs are not. Quantity is perceived to be decreasing in the large and medium diameter classes but increasing in the small diameter classes. Expectation is for future real prices ten years hence to increase between 20-30%. Factors for the perceived scarcity ranking highest in importance were increased international demand, previous high grading, landowner mistrust of loggers, and increased environmental regulations. Respondents agree that the world demand for eastern hardwoods is strong and will continue to grow.

To my family,

Al, Ruth, Karen, Patty, Jeanie, Eileen, Tom, Mary, and Cathy

ACKNOWLEDGEMENTS

I greatly appreciate the assistance I received from the many people who helped me throughout this research effort. I would like to acknowledge Dr. James Stevens who made this research possible by providing valuable guidance under the Michigan State University Eastern Hardwood Utilization Program. I am grateful for the generous funding provided by USDA/CREES Grant No.: 96-34158-2697 under the Michigan State University Eastern Hardwood Utilization Program and by the Michigan Agricultural Experiment Station.

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Chapter 1

Introduction

The veneer log resource in Indiana, Illinois, Michigan, Minnesota and Wisconsin is a valuable component of the region's forested lands. These high quality logs command price premiums which provide economic benefit to timber producers, logging professionals, regional veneer mills, and log exporters as well as secondary producers and consumers. The status of this resource has been the focus of debate since the mid-1960's when the industry shifted to producing veneer from smaller diameter logs (Hair 1966). Known as the "hardwood quality controversy" among researchers and the hardwood using community, this issue revolves around the USDA-Forest Service Forest Inventory and Analysis (FIA) conclusions regarding veneer log availability. Statistics reported by the FIA unit have indicated timber inventory increases in all diameter classes, including those necessary for efficient veneer production from 1952 through 1992 (Powell et al. 1993). Further, Powell et al. (1993) concludes that the resource is increasing both in *quality* and *quantity*. In contrast, many industry professionals, including veneer log buyers, claim the procurement of veneer timber is becoming increasingly difficult and assert that the supply of the preferred species is dwindling and the quality diminished. This study explores reasons for this discrepancy by reporting the forest statistics for six preferred hardwood species groups and examining the factors that may explain why the perception of scarcity is prevalent among forest industry professionals. The preferred species defined in this research effort are select white oak, select red oak, hard maple, ash, black cherry, and black walnut. The common and scientific names for the tree species groups under study by state are given in Appendix A.1.

The five states involved in this research effort are located in the USDA-Forest Service (hereafter referred to as Forest Service) North Central region. Of the region's 180,567,000 acres, 60,672,000 acres are forested (Table 1). The veneer industry (SIC-2435) is a small but important sector of the region's forest product industry and hardwood veneer logs represent slightly greater than 1% of the total volume of hardwoods produced in the north central region (Powell et al. 1993). The forested lands in the study area supply the veneer mills with the premium saw-timber necessary to efficiently manufacture fine hardwood face veneer. Face veneer is here defined as the veneer sheet on the upper side of a plywood or particleboard panel serving primarily a decorative rather than a structural function (The Veneer Association 1935).

Table 1. Area of land by state, survey year, and major land use class, in thousands of acres.

State	Total land area	Total forest	Timberland	Reserved forest land	Other forest land	Other land
Illinois (1984)	35,580	4,266	4,030	236	0	31,314
Indiana (1985)	22,957	4,439	4,296	143	0	18,518
Michigan (1993)	36,358.2	19,280.8	18,615.9	574.7	90.2	17,077.4
Minnesota (1990)	50,910.9	16,680.9	14,723.2	1,117.2	840.5	34,229.8
Wisconsin (1996)	34,760.9	16,005.2	15,702.5	242.0	60.7	18,755.7
Total	180,567	60,672	57,367.6	2,312.9	991.4	119,894.9

Source: Powell et al., 1993; Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997.

An abundant number of studies regarding hardwood timber supply have been conducted. There is limited information however, regarding the adequacy of the portion

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of this supply necessary to meet the hardwood veneer industries strict quality criterions. This study selected the veneer log resource from which manufacturers process face veneer using log 'flitches' which are longitudinally or stay-log rotary sliced because the end product requires the highest grade log to achieve efficient results. These two manufacturing processes produce the highly valued decorative face veneer used in architectural, panel, and furniture products. A third process of rotary peeling logs was not included in this study because rotary veneer can be manufactured efficiently using Grade 1 saw-logs versus veneer logs. Callahan (1985) defines a log flitch as "the longitudinal section of a log which has been milled specifically to enhance given characteristics of the veneers to be produced." Stay-log rotary veneering, also referred to as half round cutting, rotates one half of the log past a fixed knife producing rift-cut and half round sliced veneer (Callahan 1990). Longitudinally slicing veneer is a manner of cutting by which logs or sawn flitches are held securely in a slicing machine and passed across a large knife which shears off the veneer in sheets with flat or quarter-sawn grain patterns (The Veneer Association 1935). Defect free wood is essential to produce the clear veneer sheets of the widths and lengths that industry demands. Certain quality characteristics are required for a log to become acceptable for sliced face veneer as the relationship between the quality of a log and the quality in the end product is direct.

Some of the hardwood quality controversy can be attributed to anecdotal stories referring to the industry's early history when there was a seemingly unlimited supply of high quality veneer timber. References to these times still occur in the anecdotes-blurring myth with the historical record. The fine hardwood veneer industry was established in the United States in the early 1800's when America's old growth forests provided an

abundant supply of large diameter hardwood logs. When veneer manufacturers depleted the timber resource in one area they would often relocate to a new area where the timber had not yet been harvested. Large diameter old growth timber, with the characteristics desirable for high quality veneer, was mined with little thought to future harvests. Log production in the late 1800's and early 1900's was particularly destructive and forest management non-existent.

Today's veneer logs are produced from maturing forests that are the natural regeneration resulting from harvesting during that earlier era. West and Hansen (1996) report the eastern hardwood forests of the United States as "an example of the resiliency of nature." They note that after two centuries of timber decline due to industrial wood demand and agricultural land clearing, the inventory of the eastern hardwood forests today is similar to what it was prior to 1800. Saw-timber volume has doubled over the last forty years. Although those hardwood saw-timber volumes may not represent volumes that are available to industry, regional assessments reveal that the growth of commercially available timber still exceeds demand. Stone (1992) documents that in 1952 stands of saplings and seedlings represented 58 percent of the Lake States timberland. By 1992, two thirds of these stands were saw-timber and pole-timber size, cited by Stone as "a remarkable case of forest rebuilding."

Contradicting this positive assessment of the eastern hardwood forests are complaints by industry professionals regarding the quality and quantity of veneer grade logs. For example, in a recent interview in an industry trade journal, a prominent veneer industry executive stated "a veneer mill seeking the highest quality logs has to go much farther to obtain the volume and quality they need to maintain production levels (Panel

World 1998).” In the same interview the mill owner claims that “local supply is declining and the quality aspect is diminishing.” Significant research has been done to determine if the Forest Service FIA statistics accurately portray the true status of the resource. For example, Kellison (1988) reports that the eastern deciduous forest has been degraded by partial harvests without removing cull trees and without provision for desired reproduction. This study notes that every forest survey for the past 30 years has shown hardwood inventory increasing at a rate approximately 65 percent greater than removal, and log qualities increasing at a rate comparable to the total resource. Luppold and Dempsey (1996) addressed the issue of scarcity of eastern hardwood saw-timber and contrast saw-timber inventories with hardwood lumber production. They noted that there was strong evidence that the U.S. Department of Commerce (1970-1991) underestimated hardwood lumber production, affecting the production to inventory ratios (P-I ratios). After revising estimates of hardwood lumber production as a percentage of hardwood saw-timber inventories, the authors concluded that the PI-ratios still indicate that saw-timber growth exceeded lumber production in all but the north central region where harvests exceeded growth during the 1988-1992 time period.

No study to date has effectively refuted the Forest Service position that the overall condition of the eastern hardwood forests is improving. Previous research has been deficient in examining why veneer trees are perceived to be harder to obtain, contributing to the prevailing industry position that the resource is becoming scarce. This thesis measures the perception of scarcity of the veneer log resource among industry professionals. In this study the industry professionals are loggers who produce veneer logs, veneer log buyers, and veneer mill managers. The results of this study will be useful

to government and academic researchers as well as the forest products industry.

Quantification of the factors contributing to the perception of scarcity will determine which issues are considered most important to veneer mill managers and loggers. This research will help industry deal effectively with the economic implications of changes in timber supply affecting the veneer sector. Future research will benefit from new and important research questions on topics such as trends in utilization and technologies revealed through this study.

Objectives

More specifically, this study was designed to achieve the following objectives:

1. To measure the attitudes and perception of availability of hardwood face veneer logs among industry log buyers and logging professionals.
2. To determine the factors which are perceived to be contributing to scarcity of the veneer log resource.
3. To measure the attitudes of industry professionals regarding the quantity and quality of available supply.
4. To measure the beliefs of the industry professionals regarding future availability of the veneer log resource.

Chapter 2 is a review of existing literature pertaining to veneer log availability, the interpretation of FIA data, veneer log quality criterion, and resource quantification. Included in this chapter is a description of the Forest Service FIA survey procedures. The methods section, Chapter 3, includes a description of the survey design, the survey participants, the research instruments, survey procedures, and a description of the data

analysis. Chapter 4 is a detailed presentation of the survey results. Finally, Chapter 5 consists of the discussion of the survey results and the conclusions based on the major findings. Recommendations for future research are also included in the summary.

Chapter 2

Literature Review

Previous Studies Supporting FIA Data

Literature relevant to this study is subdivided into four main categories: factors affecting veneer log availability, factors affecting the interpretation of FIA data, factors affecting the selection of logs for veneer, and quantifying the resource. The first and second sections review trends in availability and problems associated with the FIA process from a historical perspective. The third section provides a definition of quality and relates this to the resource under study. The fourth section details the Forest Service statistics for the species groups relevant to this research effort.

Factors Affecting Veneer Log Availability

A wide variety of social and economic factors have been identified as influencing the general availability of timber to the market, subsequently affecting the market supply of high quality veneer logs. Understanding the dynamic nature of these factors is crucial to ascertaining why the perception of scarcity endures contrary to FIA survey conclusions. Schallau (1965) reported that Michigan's physical timber supply was increasing but this fact did not necessarily mean more timber would be marketed. This study identified land fragmentation, property turnover, and absentee ownership as factors that act to restrict economic supply. Current research confirms these trends on non-industrial private forests (NIPF), in addition to changing demographics and non-timber forest land uses, continue to influence hardwood supply (Jones 1994). As is the case with

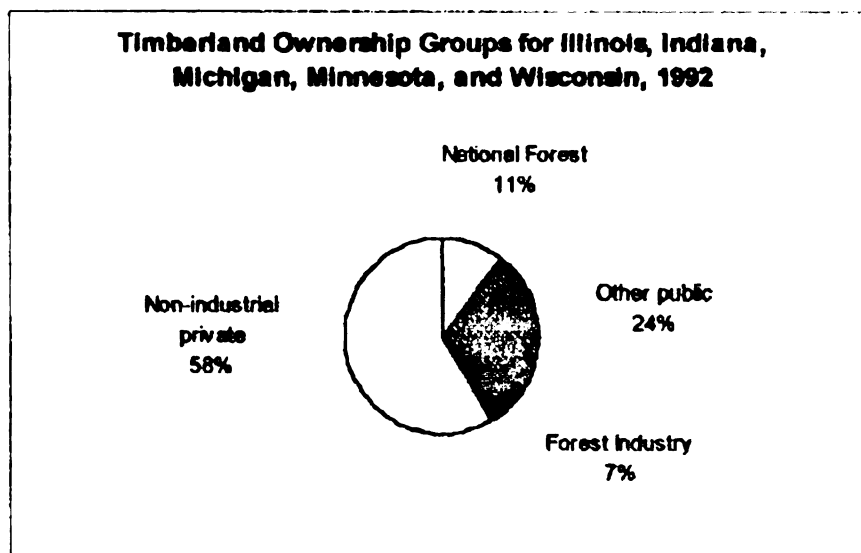
the rest of the eastern hardwood forests of the United States, the largest ownership group consists of NIPF owners (Figure 1).

Jones and Paxton (1977) address the issues of urban development on lands classified by the Forest Service as commercial forestland and conclude that much of the timber on these lands is unavailable to industry. Factors such as parcel size, average land tenure, and landowner attitudes, combined with the economies of scale for efficient forest management, make some percentage of these lands unavailable for timber production. Twenty years later, Ball (1997) finds the continuation of these trends and notes that upland forests are viewed as prime development land unencumbered by the legal complications of wetlands or the zoning and tax protection conferred on agricultural lands. Further supporting this trend, Cassens (1998) notes that the small, densely populated northeastern states show some of the largest ratios (3.48 to 6.48) of growth to removal.

Powell et al. (1993) report that since 1952, the area of timberland has decreased nationally by 4%, or 19.3 million acres, a decline attributed to withdrawals of public timberland for wilderness or other lands that do not permit timber harvests. A study by Plantinga et al. (1989) reports a 153% increase of reserved forest land in the Lake States from the mid-1960's to the early 1980's. A recent survey of land managers in the Lake States was conducted by Resh (1994) to assess the current and future availability of timberland for harvest in the region. The results of this study reveal a predicted decrease in all lands available for harvest, except for forest industry lands and Minnesota NIPF lands, and a predicted increase in all lands not available for harvest except Michigan and Minnesota forest industry lands. Factors identified affecting public land available for

timber production include policy, ecological, and economic factors. Factors identified influencing private land available included non-timber uses such as wilderness recreation, forest preservation, and individual landowner management objectives. Important forest management trends identified relevant to veneer log production and procurement were an expected decrease in even age management such as clear-cutting, and that single tree selection, often associated with high-grading, is expected to be used more extensively. Single tree selection is often used by loggers to procure the species in demand and often results in tree stands of degraded genetic stock.

Figure 1. Timberland area by ownership group for the study region, 1992.



Source: Powell et al., 1993.

The sustained international demand for eastern hardwoods has intensified competition for the preferred species. As world demand has increased, the rate of harvest has also increased to meet the new level of demand. In economic terms, if markets function properly resources tend to be allocated efficiently. Market failure in the allocation and use of resources will tend to waste resources today and not provide enough

in the future. Many industry professionals contend that previous unsustainable harvest rates, partially attributed to international demand and detrimental management practices such as high grading, have led to diminished supply, reinforcing the notion that the Forest Service statistics are incorrect. The economic pressure on available supply, created by international demand, is a factor in the scarcity issue often referred to anecdotally by industry professionals. Many company managers concerned about future supplies of veneer quality timber view the veneer log export policy of the United States as a threat (Callahan 1985). It is not uncommon to hear industry professionals recommend a ban on hardwood log exports as a solution to industry domestic supply problems. The Department of Commerce (DOC) reports increasing quantities of high quality logs being shipped to foreign manufacturers (U. S. Dept. of Commerce 1997). Once confined to veneer logs, recent reports indicate that significant quantities of grade saw logs are now being exported (Weekly Hardwood Review 1997). From 1989 through 1996 the log export volume increased about 50% (Figure 2). Data for earlier time periods is inaccurate for specific species due to reporting problems since corrected by the D.O.C., however total log exports increased steadily from 1975 to 1988 (Luppold and Thomas 1991).

Noticeable changes in demand are reflected in export volumes from 1989 and 1996 (Figure 3). For example, cherry represented 1% and maple 19% of the preferred species exported in 1989. By 1996 these two species increased to 9% and 37% respectively. Walnut and white oak declined from 10% and 35% in 1989 to 3% and 19% in 1996, respectively. Caution must be employed in interpreting these data as the percentage decreases do not reflect the fact that total log export volumes have increased.

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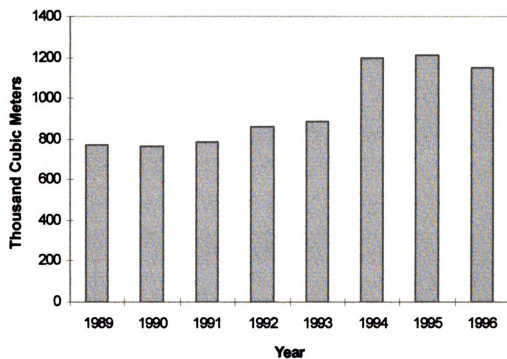
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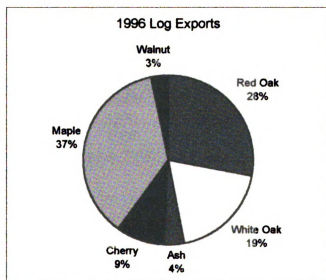
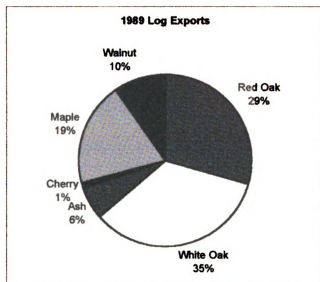
The increase in popularity of lighter colored woods however, illustrates the dynamics of the export markets and how preferences change.

Figure 2. U.S. hardwood log exports, 1989-1996.



Source: U.S. Department of Commerce, Bureau of the Census. 1997.

Figure 3. Preferred species exported from United States by percent, 1989 and 1996.



Source: U.S. Department of Commerce, Bureau of the Census. 1997.

Factors Affecting the Interpretation of FIA Data

A wide variety of factors influence the interpretation of Forest Service inventory statistics. For instance, the states conduct their inventories during different time periods, typically about every ten years (Table 2). Discrepancies also arise when there are changes in procedure and definitions between inventories. Comparisons between inventories are conducted in order to identify trends but direct comparisons between the current inventory and the previous inventory can be misleading due to these changes. The Forest Service addresses this issue by checking for consistency through the use of the Timber Resource Analysis System (TRAS). TRAS is Forest Service computer program for “updating, backdating, and projecting timber volume, growth, mortality and removals (Raile 1985)”. Inconsistencies are identified and resolved and corrected values for previous inventories are available for comparisons.

Table 2. FIA inventory dates by state.

State	Current Inventory	Previous Inventory
Illinois	1986	1967
Indiana	1985	1962
Michigan	1993	1980
Minnesota	1990	1977
Wisconsin	1996	1983

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Illustrating several of the problems which arise between surveys are two studies conducted by Forest Service researchers from the Southern Forest Experiment Station which address the concerns of the hardwood using community. Beltz et al. (1990) report a decline in top quality hardwoods due to a procedural change in tree grading. The 1987 Mississippi FIA statistics reported an increase of 30 percent in Grade 1 hardwood over the previous survey conducted in 1977. In 1977, survey crews graded the butt log and

predicted the grades of the upper stem logs. The results were reported as “log grades.” In 1987, all saw-timber volume in the stem was tabulated by the grade of the butt log in a process called “tree grade”, using standard log grades published by the Forest Service. Beltz et al. recalculated the 1977 log grade using the 1987 tree grade standard and compared 1977 tree grade values with 1987 survey results. When compared on the same basis, the Grade 1 volume showed a decline.

The Beltz et al. research effort did illustrate that Forest Service butt log grading is reasonably comparable to private industry hardwood specialists and perhaps is conservative. The FIA surveys require a 12-foot minimum butt log, while industry relies on published grades for hardwood factory logs which allow for 10 foot logs in all grades. Additionally, several differences between industry log grading and standard Forest Service inventory practices were isolated as factors contributing to the hardwood quality controversy. Among these are the standard units, International ¼ inch rule, in which the Forest Service reports its results. Industry generally uses the Doyle log rule that contains values that are roughly 71 percent of the International ¼ inch rule values (Smith and Hackett, 1991). Another factor influencing the interpretation of FIA data is the fact that states grade hardwood saw-timber trees by rules established in three different sources. Michigan and Minnesota grade hardwood saw-timber trees by rules established in “Hardwood Tree Grades for Factory Lumber (Hanks, 1976).” Wisconsin and Illinois grade trees by rules established in the research report “Hardwood Log Grades for Standard Lumber (Vaughn et al., 1966).” Indiana grades its hardwood saw-timber according to rules established in “A Guide to Hardwood Log Grading (Rast, 1973).”

May and LeDoux (1992) developed a procedure for assessing timber availability from reported inventory statistics for upland hardwood forests in Tennessee. This study was initiated in response to criticisms leveled at the southern FIA unit (SOFIA). A profitability model was constructed to predict stump to mill cost of the growing stock of selected SOFIA sample plots. Inventory that is profitable to log was determined and then discounted for owners who are not willing to sell. Their results conclude, “about a quarter of the timberland, containing about 40 percent of the reported inventory volume, was estimated to be available for harvest.” However, this research also concluded that the smaller “available inventory is essentially capable of meeting harvest demands, but its growth to removals ratio is not nearly as favorable as that of the reported inventory.”

In addition to changes in procedure and definitions, the aggregate nature of the Forest Service FIA data require that caution be employed during the interpretation process. Luppold and Dempsey (1996) note that because the Forest Service statistics are based on aggregate data, species specific and quality specific timber shortages are difficult to identify. In contrast, industry conclusions tend to be drawn from species specific and quality specific data in local procurement areas. Further, these researchers also cite the infrequency of timber surveys as a potential problem when interpreting the FIA statistics. The state inventories are completed on staggered time schedules and “any estimate of saw-timber volume for a single year must be projected by assuming historic timber growth and removal trends” (Luppold and Dempsey 1996). They note differences in assumptions, supporting data, and estimation procedures can result in inventory projections that are inconsistent between regions. Luppold and Dempsey (1996) for example note that in Minnesota, statewide growth and harvest rates for red oak saw-

timber have remained about even, but in southern Minnesota harvests of red oak have greatly exceeded growth. In sum problems regarding data are a concern to researchers (Stevens 1994).

A key component of the Forest Service inventory analysis is the ratio of hardwood saw-timber growth divided by removals. Recent analysis of timber supply in the Lake States documents a very favorable relationship between growing stock and timber harvests (Table 3). Noting that a growth to removal ratio less than one indicates resource depletion, analysis of the most recent Lake States surveys reveal this ratio to be 2.1:1 (Vasievich et al., 1995). This is the case despite an overall increase in saw-timber production since the 1970's. This research further indicates that increase in demand for saw-timber has led to rising real prices for stumpage. The impact of rising real prices to the veneer sector may be reflected in the economics of price expectation. Economic theory states that expectations of a higher future relative price of a product can affect sellers' willingness to supply (Allen 1994). Hardwood Market Report data support the assertion that prices have risen in real terms (Appendix B).

Table 3. Average net annual growth and removals of hardwoods on timberland, by state and survey date, in thousand board feet International ¼ inch rule.

State	Year	Growth	Removal	Ratio
Illinois	1964	610	173	3.53
	1984	425	305	1.39
Indiana	1966	218	344	.63
	1985	687	461	1.49
Michigan	1986	1690	836	2.02
	1993	2665	776	3.43
Minnesota	1976	731	290	2.52
	1989	1105	568	1.95
Wisconsin	1982	984	693	1.42
	1996	1187	818	1.45

Source: Cassins, 1998; Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Factors Affecting the Selection of Logs for Veneer

The trend toward the use of small-diameter logs for veneer was evident in the 1950's. Initial reports were that veneer manufacturers were pleasantly surprised with the quality of the veneer obtainable from small diameter logs (Fleischer 1965). Over time however, complaints by the veneer industry regarding quality were addressed and the Forest Service proposed a systematic set of veneer grading rules designed to promote uniformity of grading (Haskell 1963). The Forest Products Laboratory defined quality as “those properties that make it suitable for conversion into end products for a given use, and lead to a system of sorting the products into groups with similar characteristics (Henley et al. 1963).” The authors reported that in order to establish grades for hardwood veneer logs or veneer in standing timber, grades that specify type, number, distribution and size of defects for the end product must be first established. Three quality classes that reflect value and veneer grades were proposed (Table 4). Grade A would be required to produce face veneer. Unlike hardwood lumber, which has standardized grades that are accepted throughout the industry, the veneer sector resisted product standardization. Today the veneer industry is highly specialized and veneer log grading continues its historic trend of varying between manufacturers and individual graders. This factor makes quality evaluation problematic and contributes to the scarcity issue.

Veneer grading tends to be proprietary, differentiated by product end use. Veneer grades are typically classified as architectural, panel, desktop, door, and furniture. These classifications are indicators of value (Workman 1996). Architectural, panel, desktop, and door grade veneer bring premium prices based on length, width, and appearance characteristics. Furniture grade veneer tends to be low priced and the utilization of

imperfect veneer is increased at the clipping line where defects are removed. Anecdotal evidence suggests that few manufacturers slice for furniture grade veneer as they accumulate large quantities in the pursuit of high-grade material. Clipping line technology allows manufacturers to make veneer from logs that otherwise would not qualify as veneer grade. Previous research indicates that the clipping lines are a major source of waste as significant quantities of clear veneer are discarded to eliminate defects. Clipping line waste for red and white oak manufactured in 1980 was reported to be 13 million square meters valued at \$11.6 million (Davis and Callahan 1986).

Table 4. Forest Products Laboratory veneer grades.

Grade	Quality	Description
A	Clear	Smooth and free of defects
B	Sound	Smooth and free of open defects
C	Utility and Back	Defects permitted in B grade plus open knots, holes, and insect damage up to 2 inches in diameter.

Source: Haskell, 1963.

Specific quality indicators must be present for logs to be accepted as face hardwood veneer grade. Haskell (1963) defined grade defects as “any irregularity occurring in or on wood that adversely affects its appearance, strength, durability, or utility values.” External characteristics of trees and the cross sections of cut logs only provide clues to the quality of the wood inside. Harrar (1954) lists external imperfections that are likely to disqualify logs as potential veneer. Defects that are found on the circumference of the tree are defined as bird peck, adventitious and dormant buds, bulges, burls, butt swell, flanges, grooves, holes, knots, seams, spiral bark, and tension wood. Defects that can be seen on the ends of logs are flag worm, gum spots, heart rot, pith

flake, ring shake, stain, spider heart, double pith, wind shake and out-of-round. Today some defects, such as burls and other figured woods, are highly prized for their unique appearance characteristics. Consequently, veneer defects are categorized as desirable and undesirable.

The premium saw-timber necessary to efficiently manufacture fine hardwood face veneer is found in the Forest Service log Grade 1 category. When industry specialists are extrapolating quality criteria from these Forest Service statistics, the highly subjective nature of quality evaluation tends to contribute to the hardwood quality controversy. Veneer log price premiums are based on diameter, length, straightness, the absence of visible defects, uniformity in both color and growth ring count, and the texture of the wood itself. Additionally, economic factors such as supply, demand, and competition strongly influence veneer log prices.

It is critical that veneer logs are straight, as a slight crook or sweep will affect the quantity of veneer yielded from the log. Often logs are sliced for specific veneer grain patterns and log straightness is mandatory to achieve the desired end result. The heart of the log must be centered and round logs are preferred to those that are out of round. Most veneer logs will have defects close to the heart and when the pith is off centered these defects will show up sooner in the slicing process resulting in a lower valued end product. These problems can often be addressed when the tree is bucked into logs and research has indicated that improved log bucking practices increases the value of the logs with an average potential gain of 31% (Dwyer 1995).

Log length is crucial and premiums are paid for veneer quality logs of desirable lengths. Buyers purchase logs to meet specific customer requirements such as the

manufacture of architectural, panel, desktop, door or furniture products. Logs destined to become veneer are first milled into flitches and must be free from major cracks and splits which would reduce overall length in the clipping process. When mills inventory logs, longer lengths represent more manufacturing options so additional value is attached. Veneer log lengths may be in odd increments when compared to lumber log lengths. For example, veneer logs may be 9, 11, 13, or 15 feet long instead of the customary 8, 10, 12, 14, or 16 foot seen in standard lumber lengths.

Workman (1996) reported color and texture as two important indicators used by veneer graders as quality determinants. For uniformity of color the log must be 1) the desired color, and 2) have consistent color throughout the flitch. Often designers are attempting to solve finishing department problems by procuring veneer that is uniform in color and easily matched to solid wood components. Color requirements differ in the domestic and international markets with foreign competitors paying higher prices and being extremely selective for color. Selection for color presents special problems in veneer log procurement and color varies with site (Nelson et al.1969). This factor may contribute to perceived scarcity, as competition for quality logs, reflected in price and production pressures, tends to be concentrated in geographic regions known for consistent color. For example, Workman (1996) reported walnut grown in southern Indiana had a higher concentration of the desired light chocolate brown color than Missouri walnut leading to higher demand for Indiana walnut. Soil factors were attributed to the reddish color predominantly found in Missouri grown walnut of less value to veneer mills.

Diameter growth rate, or the number of growth rings per inch, is also a major quality determinant. Logs with evenly spaced tight growth rings command a price premium and certain aesthetic characteristics can be manufactured only from these logs. For example, the quarter-sawn tight grained pattern found in traditional Japanese furniture must be sliced from logs that have a minimum of 10-15 growth rings per inch. Old growth timber consistently yielded logs with uniformly tight growth rings. With single tree selection harvesting being increasingly used, the residual stand is released to grow rapidly. Consequently, future supplies of logs exhibiting dense, even spaced growth rings may be further reduced.

Quantifying the Resource

Are high quality veneer logs of the preferred species becoming scarce? The U.S. Forest Service, in cooperation with the states, spends a great deal of money and effort to compile reliable resource data. Statistics are arrived at through well-established sampling techniques reliable within published error limits. The Forest Service inventory data, published in the FIA surveys, have consistently reported increases in all diameter classes including those necessary for efficient veneer production. One problem in trying to ascertain if veneer quality is changing is that FIA data do not quantify veneer statistics as such. Instead statistics are reported for growing stock and saw-timber volumes. The perception that the FIA data are incorrect in both quality and quantity stems partly from the fact that availability is not reported with the survey conclusions. Clearly, not all saw-timber is available for industry use. A brief review of the survey procedures is necessary to increase understanding of the FIA process.

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FIA Survey Procedures

The FIA survey design includes interpretation of current aerial photography, new and old inventory plot measurements, and estimates of area, volume, growth, mortality and average annual removals. The survey techniques are updated between inventories to improve accuracy. As mentioned earlier, however, this can result in comparison problems between inventories. The current inventories completed by the states under study use a two phase sample design, similar to sampling with replacement, and the Stand and Tree Evaluation and Modeling System (STEMS). STEMS is the tree growth projection component of the Forest Resources Evaluation Program (Belcher et al. 1982). The STEMS growth model is used to 'grow' the old plot and tree data to produce an estimate of current data (Leatherberry et al. 1996). Phase one analysis include aerial photo interpretation of plots used in the previous survey plus additional new plots. The data gathering effort taken by the Forest Service to ensure statistical accuracy yields over 100,000 ground plots in the five state region (Table 5).

Table 5. Ground plots measured and photo points classified by state and survey date.

State	Total Ground Plots Measured	Total Photo Points Classified
Illinois (1985)	10,847	184,815
Indiana (1986)	11,440	126,629
Michigan (1993)	18,584	196,951
Minnesota (1990)	43,959	284,420
Wisconsin (1996)	20,940	203,326

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Phase two consists of the field measurements in which the plots from the previous survey classified as 'disturbed' or 'undisturbed' are quantified. All of the disturbed plots are remeasured. One-third of the undisturbed plots are remeasured, while the remaining 2/3 of undisturbed plots are not remeasured but are updated with STEMS.

Questions regarding the accuracy STEMS growth model have been addressed. Weaknesses have been identified in the data collection phase and corrected by taking sample sizes large enough to guarantee statistical accuracy. While "no projection system can perfectly represent the real system being modeled," the STEMS modeling system solves a variety of inventory and management problems (Buchman and Shifley 1983). Two components of the STEMS model are designed to ensure that the results are biologically reasonable. First, STEMS contains "a growth potential function estimating maximum expected growth for trees of a specific species, size, and crown ratio on a specific site." Second, STEMS contains "a modifier function to reduce potential growth based on the amount of competition from other components (Shifley 1987)."

Survey Accuracy

States in the study region quantify area, number of trees, volume, growth, removals, and mortality using Forest Service analytical processes. The FIA sampling procedure is "designed to provide reliable statistics at the state and survey unit levels (Leatherberry et al. 1996)." The figures reported are estimates only and reliability is measured by sampling error. For each of the five states in this study the sampling errors mean "that the chances are two out of three that if a 100 percent inventory had been taken, using the same methods, the results would have been within the limits indicated

(Leatherberry et al. 1996).” By design, the sampling error increases when the survey data is analyzed in sections smaller than the state totals.

The current inventories have a goal of reporting figures with a sampling error of less than ten percent at the county level. Minnesota funded the collection of additional data in order to reduce the sampling error of three percent per million acres of timberland in the standard FIA inventory by one-half. Michigan increased survey accuracy by intensified field sampling funded by the State of Michigan, industry, and forest products associations. Michigan’s goal of reporting figures with sampling errors less than ten percent was reached in the heavily forested counties. Counties with less than 35,000 acres of timberland however exceed ten percent (Leatherberry et al. Appendix A.2).

Net volume of growing stock

The FIA statistics are reported in standard units and tables. The inventory is reported for growing stock and saw-timber, saw-timber being a subset of growing stock. Growing stock volume is defined as “net volume in cubic feet of growing stock trees 5.0 inches diameter breast high and over, from 1 foot above the ground to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs (Miles et al. 1995).” There are 19,261,858 cubic feet of growing stock trees of the preferred species in the study area.

The growing stock figures reported between surveys indicate increase for all five states in the study region. Factors influencing this trend include changes in survey procedures, abandoned cropland and pasture reverting back to timberland, and the reclassification of nonproductive timberland to marginally productive timberland (Powell et al. 1993). Substantial increases in growing stock volume have occurred (Table 6).

Net volume of saw-timber

Saw-timber volumes contain the diameter classes necessary for the efficient manufacture of veneer. A saw-timber tree is defined as “a live tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, meeting regional specifications for freedom from defects which for hardwoods must be at least 11.0 inches d. b. h. (Leatherberry et al. 1996).” Veneer log minimum diameters generally begin in the 13-inch diameter class, with larger diameters being more desirable and a select few logs taken from the 12-inch diameter class. Examination of diameter class distribution for net volume of saw-timber for the preferred species (Figure 4), illustrates the “wave of maturing timber” in the 21-28 inch diameter classes reported by Stone (1992). The total net volume of saw-timber for the species groups under study is greater than fifty-nine billion board feet measured in International ¼ inch rule (Table 7). The net annual growth for these species is greater than two billion board feet International ¼ inch rule (Table 8). The current annual timber removals for the species groups under study are reported to be slightly greater than a billion board feet and annual mortality for these species groups is reported to be about 220 million board feet (Leatherberry and Spencer 1996; Miles et al. 1995; Schmidt 1997; Smith and Golitz 1988; and Hahn 1987). This leaves slightly greater than one billion board feet annually added to the inventory, representing a net annual growth of approximately 43%.

The net volumes of hardwood saw-timber in the five-state area for the 15-29 inch diameter classes have increased substantially during the 1952-1992 time period (Figure 5). The net volume of hardwood saw-timber in each state increased during this time

period (Table 9). The saw-log and veneer log production data in the study area for the species groups under study are shown in Tables 10 and 11.

Table 6. Percent increase between inventories of growing stock on timberland by species group, state, and survey dates, in thousand cubic feet.

State	Survey Dates	Select White Oak	Select Red Oak	Ash	Hard Maple	Black Cherry	Black Walnut
Illinois	1962-1986	43	56	19	63	NA ¹	54
Indiana	1967-1986	12	10	83	65	86	52
Michigan	1980-1993	43	41	67	43	45	62
Minnesota	1977-1990	41	22	45	40	26	73
Wisconsin	1983-1996	47	22	44	34	22	1.14

1. Figures reported with other hardwoods.

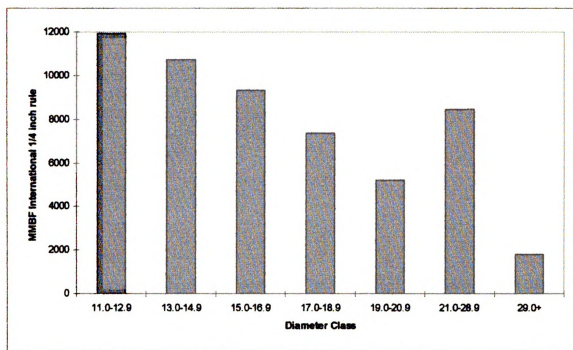
Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Table 7. Net volume of saw-timber on timberland by species group for current survey, in thousand board feet International ¼ inch rule.

Species Group	Lake States, Illinois, and Indiana
Select White Oak	14,208,867
Select Red Oak	16,864,613
Hard Maple	17,085,624
Ash	8,038,808
Black Cherry	2,011,002
Black Walnut	1,167,679
Total	59,376,593

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Figure 4. Net volume of saw-timber on timberland in study region, by diameter class.



Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Raile, 1985; Smith and Golitz, 1988; and Hahn, 1987.

Table 8. Current net annual growth of saw-timber on timberland by species group for current survey, in thousand board feet International 1/4 inch rule.

Species group	Lake States, Illinois ¹ , and Indiana ¹
Select White Oak	394,013
Select Red Oak	594,026
Hard Maple	672,207
Ash	392,656
Black Cherry	105,016
Black Walnut	47,378
Total	2,205,296

1. Reported as net annual growth.

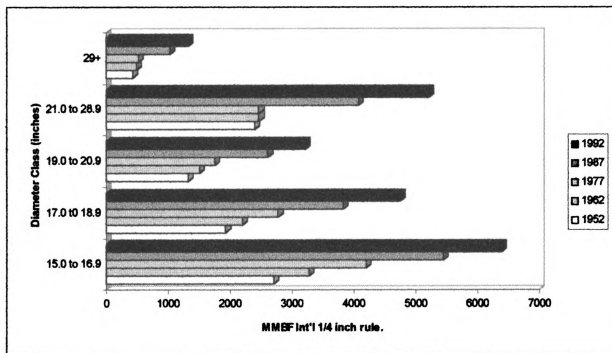
Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Table 9. Net volume of hardwood saw-timber on timberland by state for 1952, 1962, 1977, 1987, and 1992, MMBF International ¼ inch rule.

State	1952	1962	1977	1987	1992
Illinois	9,488	10,931	14,665	17,156	17,782
Indiana	8,754	10,655	10,713	18,600	18,946
Michigan	16,764	23,365	29,155	34,049	39,451
Minnesota	6,272	8,742	16,077	19,801	22,693
Wisconsin	10,259	13,206	20,614	27,344	30,394
TOTAL	51,537	66,899	91,224	116,950	129,266

Source: Powell et al. 1993.

Figure 5. Net volume of hardwood saw-timber on timberland in the Illinois, Indiana, Michigan, Minnesota, and Wisconsin by diameter class, 1952-1992.



Source: Powell et al. 1993.

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Table 10. Saw-log production by species group, state, and survey date, in thousand board feet International ¼ inch rule.

Species group	Wisconsin 1996	Indiana 1984	Michigan 1992	Minnesota 1988	Illinois 1983	
Select White Oak	50,652	41,751	18,831	10,121	21,420	142,775
Select Red Oak	128,005	41,560	84,755	47,134	13,730	315,184
Hard Maple	70,098	19,969	102,494	1,630	3,261	197,452
Ash	19,316	24,599	3,260	9,502	7,280	79,195
Black Cherry	4,705	6,543	6,141	562	868	18,819
Black Walnut	697	8,845	2,297	736	2,954	15,529
Total						768,954

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Table 11. Veneer log production by species group, state, and survey date, in thousand board feet International ¼ inch rule.

Species group	Wisconsin 1996	Indiana 1984	Michigan 1992	Minnesota 1988	Illinois 1983	
Select White Oak	3,083	4,362	1,129	158	2,033	10,765
Select Red Oak	9,319	1,165	3,927	989	101	15,573
Hard Maple	6,494	234	14,475	62	-	21,265
Ash	260	461	1896	498	18	2,559
Black Cherry	474	34	574	-	-	1,082
Black Walnut	234	2,889	324	99	760	4,306
Total						55,550

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

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Chapter 3

Research Methods

Factors potentially influencing the availability of veneer logs, FIA data interpretation, veneer log quality issues, and the Forest Service statistics regarding the species groups involved in this research effort were presented in Chapter 2. Currently no measurement of the industry's perception of resource scarcity exists outside of the anecdotes prevalent throughout the veneer sector. This study therefore, developed survey procedures to measure the attitudes of industry professionals regarding veneer log availability, quantity, and quality, to quantify the factors perceived to be contributing to their scarcity, and to measure the beliefs of the population about future availability of veneer logs. This chapter describes the survey design, participants, the research instrument, survey procedures, and the data analysis.

Survey Design

The purpose of this study is to quantify the perception of scarcity regarding veneer logs of the preferred species in the study area. Loggers, sawmill procurement managers, veneer log buyers, and consulting foresters compete among each other for access to the veneer log resource in the study region. These individuals are the experts whose opinions are measured by the survey. Veneer log procurement is highly specialized work. Procurement specialists typically start their workday early and work late as their job requires significant amounts of travel. The time consuming nature of this work creates data collection problems solved most efficiently through the use of survey research. The purpose of a survey is to produce statistics—that is, quantitative or

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numerical descriptions of some aspects of the study population (Fowler, 1993). Surveys are excellent vehicles for measuring attitudes and orientations in a large population (Babbie, 1995). A variety of survey methods are available to elicit expert opinion. Personal or telephone interviews of this population do not represent the best survey option. The extensive driving required in personal interviews, and the expense both in terms of cost and time required in telephone interviews, made these alternatives less desirable than a mail questionnaire. Self-administered mail questionnaires have the advantage of reaching a large audience dispersed over the study region relatively inexpensively. For the purposes of this study, a mail survey was determined to be the most efficient manner of data collection considering the large number of participants and the size of the study region. This study therefore, uses a cross-sectional survey design administered through a mailed questionnaire. The survey data reflects the opinions of participants in 1997. The discussion that follows describe the participants selected to receive the survey.

Survey Participants

The highly specialized nature of the fine hardwood veneer industry is reflected in its dominant log procurement strategy. Unlike the hardwood sawmill industry, which largely procures timber from individual landowners, the veneer sector relies on procurement specialists to purchase produced logs from loggers and regional sawmills. This allows the veneer mills to select logs of the highest quality which is reflected in the high prices these logs command. It is this group of industry professionals, those

interacting in the production, purchase, and sale of veneer logs, whose opinions are valuable to this research effort and constitute the survey population.

Callahan's (1990) historical documentary, "The Fine Hardwood Veneer Industry in the United States: 1838-1990," reports that there have been approximately fifty firms in the US involved in producing face veneer at any one given time. This documentary concludes that the structure of the veneer industry has been changing and notes that since World War II, foreign ownership has increased to the point that the veneer sector is roughly 70% foreign controlled. In the study region there are thirty-eight veneer plants listed in the primary producer guides (Appendix C.1). The trend is toward a decreasing number of veneer mills in the study region (Table 12). Callahan (1985) notes that annual production has increased while the number of mills in operation has decreased. In economics, concentration is a measure that shows how much business is done by how few sellers (Allen, 1994). Production data supports the position that the veneer industry is becoming more concentrated and efficient. In the hardwood veneer and plywood industry, output per employee increased 5.5% and total output increased 6.8% during the 1982-1986 time period (Callahan, 1985).

Because the industry is relatively small, it was determined that a survey of the total population (i.e. census) of veneer log procurement specialists would be appropriate. This census was conducted on 1) the veneer mills' log procurement managers, and 2) loggers, sawmill managers, consulting foresters, and veneer log buyers who listed veneer logs as a product in the Lake States wood products primary producer guides (Michigan 1996; Minnesota 1997; and Wisconsin 1995 Department of Natural Resources). State laws in Indiana and Illinois require that all timber buyers must purchase a license. The

complete timber buyers license lists for Indiana and Illinois were included in the survey population (1996 Illinois Licensed Timber Buyers and 1996 Indiana Licensed Timbers Buyer's Guide). However, unlike the Lake States primary producer guides, which were filtered for veneer log producers, the Indiana and Illinois timber buyers' license lists included forest products specialists not involved in the veneer log business. Therefore, a filter question was included in the self-administered mail surveys to determine if the recipient was involved in the veneer log business. It should be noted that in the Lake States there are loggers and sawmills that engage in the veneer log business but do not list veneer logs as one of their products or otherwise are not registered with the states. Consequently, this census does not include these people. The licensing law in Illinois and Indiana circumvents this problem.

The recipients of the logger's survey consisted of 1481 industry professionals. Of these 568 resided in Indiana, 435 in Illinois, 386 in Michigan, 28 in Minnesota, and 64 in Wisconsin. The population that received the veneer mill survey consisted of fourteen log procurement managers in Indiana, one in Illinois, ten in Michigan, eleven in Wisconsin, and two in Minnesota. Veneer mills included facilities engaged in the production of rotary veneer, which is not the focus of this study. However, prior to the construction of the survey instrument, informal conversations with industry specialists revealed that most of these operations are engaged in trading face veneer logs or have their high-grade veneer logs custom sliced. These mills therefore, were included in the survey population with the specification that the survey answers be directed toward the high grade logs. The sampling design for this census is single stage. The names in the population were known and were sampled (Creswell, 1994).

Table 12. Number of veneer mills between USFS mill surveys.

State	Survey Date	Number of Veneer Mills
Illinois	1961	8
	1983	2
Indiana	1980	16
	1990	14
Michigan	1977	9
	1992	7
Minnesota	1975	4
	1992	1
Wisconsin	1981	15
	1994	12

Source: Hackett and Whipple 1995; Hackett and Mayer 1993; Hackett and Dahlman 1993; May and Pilon 1995; and Blyth et al. 1987.

The Research Instruments

The research instruments used in this research effort are self-administered mail questionnaires (Appendix C.3 and C.5). The surveys were designed based on issues identified through informal discussions with academic researchers, government natural resource agencies, and industry professionals knowledgeable of the veneer log resource and supported in the review of the literature. The surveys are intended to elicit the opinions of industry professionals regarding the perception of veneer log scarcity involving the preferred species groups identified in Chapter One. For comparative purposes, it was determined that log procurement managers working at the 38 regional veneer mills should be surveyed separately from the loggers. The two survey instruments administered were identical with the exception that the veneer mill survey included questions regarding industry trends and business strategies applicable only to veneer manufacturers.

The loggers, sawmill managers, consultants, and veneer log buyers were asked four major categories of questions related to: 1) quality, quantity, and future price of the preferred species; 2) factors influencing domestic availability, and future availability; 3) veneer industry market characteristics; 4) and veneer log exports. In addition to these four major groups of questions' recipients were asked to identify how many years they had been in veneer log procurement and to describe their job position. A question regarding sustainability also was included in the survey. Participants were encouraged to write in any additional information regarding their knowledge of the veneer log resource in a comment section available at the end of the survey. A fifth category regarding business strategies and industry trends was included in the veneer mill survey only. The discussion that follows is a detailed description of each category of questions.

Respondents were first asked the filter question to determine if they were involved in the veneer log business. Recipients answering no to the filter question were asked to return the uncompleted survey in the self-addressed stamped envelope while recipients who responded yes were to continue the survey. Next, respondents were asked how many years they had been involved in veneer log procurement, sales, or consulting. This was designed to compare answers across groups with more or less procurement experience. Recipients were then asked to describe their job positions as logging, sawmill management, veneer log buyer, consulting forester, or 'other.'

In the first major category of questions, respondents were asked if they felt the quality of veneer logs for the preferred species in the study region is increasing, about the same, or decreasing. This ordinal measure allowed each species group to be rank-ordered separately. Respondents were also allowed the option of answering that they don't know.

Respondents were also queried about the quantity of the small (11-15 inches), medium (16-20 inches), and large (21+ inches) diameter size classes of veneer logs. The ordinal measures increasing, about the same, or decreasing allowed each size class to be rank-ordered separately. Respondents were also allowed the option of answering that they don't know.

Since the price of a resource growing scarce will eventually rise due to increases in its extraction cost and/or payments to resource owners, a question regarding future real price increases of the veneer log resource was included in the survey (Costanza 1991). Again the ordinal measures increasing, remaining the same, or decreasing allowed the species groups to be rank-ordered separately. Respondents were asked to include a percentage figure they perceived the prices to increase or decrease by. In this question respondents were not given the option of answering they don't know.

The second major category of questions concerned factors influencing availability, domestic availability, and future availability. Respondents were asked to indicate to what extent they agreed or disagreed with statements about veneer logs. Variables measured included location of veneer quality timber, time in procurement, high-grading and selection harvests, management plans on NIPF lands, whole tree chipping, standardization of tree grades, sustainability of current harvest rates, and the relationship of price to availability. A Likert scale was constructed to measure the relative intensity of the statements. Likert scaling calculates the average index score for those agreeing with each of the individual statements (Babbie, 1996). The ordinal measures from which respondents were to choose were strongly agree, agree, neutral, disagree, and strongly disagree.

Respondents were further asked to rank in importance factors affecting domestic availability. Included in these factors were the variables increased international demand, conflicting landowner objectives, urban development, forest land fragmentation, property turnover, absentee ownership, parcel size, previous high-grading, environmental regulations, and mistrust of loggers. A Likert scale was constructed to measure the relative importance of these factors to the domestic availability of veneer logs. The ordinal measures from which respondents were to choose were very important, somewhat important, neutral, somewhat unimportant, and very unimportant.

Respondents were also asked to rank in importance factors determining future veneer log availability. Variables measured included forest management education programs, tax incentives on non-industrial private forest land (NIPF), elimination of the estate tax, special capital gains taxes, uniform laws requiring best management practices, timber buyers certification, and funding stewardship programs. A Likert scale was constructed to measure the relative importance of these factors in determining future availability of veneer logs. The ordinal measures from which respondents were to choose were very important, somewhat important, neutral, somewhat unimportant, and very unimportant.

The third major category of questions concerned the importance of certain market characteristics to the veneer industry. Included in these were establishing uniform veneer log grades, standardizing veneer product grades, banning hardwood log exports, promoting character marked wood, competition from substitute products, marketing odd species, and log color. Respondents were asked to rank these variables in order of importance. A Likert scale was constructed to measure the relative importance of these

market characteristics. The ordinal measures from which respondents were to choose were very important, somewhat important, neutral, somewhat unimportant, and very unimportant.

The fourth major category of questions concerned the perceived impact of international markets on the veneer log resource. First respondents were asked if their customers (domestic and international) want to know whether the veneer logs they buy originate from sustainable forest management. Nominal measures that applied to this question were yes and no. Recipients who were unsure were permitted to answer don't know. Second, a filter question was asked to determine if the respondent produced or sold face veneer logs for international markets. Nominal measures applicable to this question were yes and no. Recipients who were unsure were permitted to answer don't know. If a respondent answered no they were instructed to stop the survey and return it in the self-addressed stamped envelope provided. Respondents answering yes were instructed to continue the survey by first indicating whether they sell to a broker, directly to international customers or to domestic veneer manufacturers that export.

Respondents were asked what percentage of veneer logs they produce or purchase are exported. The ratio measures for this variable were less than 1%, 1 to 10%, 11-25%, 26-50%, 51-75%, and 76 to 100%. Further, respondents were asked to what extent they agreed or disagreed with four statements regarding international demand. The variables included government policy, foreign competition, world demand, and changes in species demanded. A Likert scale was constructed to measure their relative agreement with the statements using the responses strongly agree, agree, neutral, disagree, and strongly

disagree. The logger's survey concluded with an open-ended comment section that encouraged respondents to air their opinions about the status of the veneer log resource.

The veneer mill survey included a fifth major category regarding business strategies and industry trends. Variables measured in the industry trends question included veneer log volumes, industry profit margins, specialization, percentage of price increases to landowners, marketing, yield of architectural, panel, and furniture grade veneers, and customer acceptance of defects. The ordinal measures increasing, about the same, or decreasing allowed these trends to be rank-ordered separately. Respondents were also allowed the option of answering they don't know.

Respondents were asked if they were finding it more difficult to purchase veneer logs. Nominal measures to this question were yes and no. Recipients who were unsure were permitted to answer don't know. This question acted as a filter to the business strategy question as respondents who answered no to this question were instructed to skip the strategy question. Variables in the business strategy question were hiring additional log buyers, installing new equipment technologies, holding lower log inventories, and an open-ended 'other' comment section. The hiring additional log buyers and holding lower log inventory questions were arranged so respondents could check a box if that business strategy applied. Checking the box is equivalent to a nominal measure of yes while leaving the box unchecked is equivalent to a nominal measure of no. The equipment technologies and 'other' questions were structured as open-ended comments. Results from these questions identify which technologies are being implemented or what 'other' factors are considered important by the veneer sector.

Survey Procedures

A six-page draft-survey, designed to elicit the perceptions of loggers and veneer mill procurement specialists, was pre-tested among researchers and industry professionals. Revisions were made to improve reliability and validity. The revised draft survey was reviewed by the survey consulting service of Michigan State University, the Institute for Public Policy and Social Science Research (IPPSSR), prior to the initial mailings. Changes to the question format and general survey layout were made as per IPPSSR suggestions. The final survey was mailed in two stages. First, the 1482 recipients from the Lake States primary producer's guides and the Indiana and Illinois timber buyers license lists were mailed the logger's version complete with a pre-paid return envelope (Appendix C.5). A cover letter was sent with the survey explaining the research project, how the participants were selected, the voluntary nature of the survey, and the confidentiality of the results (Appendix C.4). The surveys were numbered to prevent the accidental re-mailing of reminders to respondents. Three weeks after the initial mailing a postcard reminder was sent to all non-respondents (Appendix C.6). Another three weeks passed before a second survey complete with a new cover letter was mailed to all non-respondents (Appendix C.8). Assuming that the independent nature of loggers might result in a low response rate, a device was built into the second cover letter designed to get the respondent's attention. The second cover letter informed the recipients that a colleague of theirs with twenty years of experience in the logging and sawmill industry designed the survey. This factual statement was designed to appeal to their sense of fraternity. Furthermore, recipients were informed that federal, state, and university foresters were following this research effort and their opinions would be heard.

Additionally, two untarnished 1998 pennies were fixed to the second cover letter informing the recipients that this survey presented them with the opportunity to '*get your two cents worth in.*' Each second cover letter, printed in black ink, was signed individually in blue ink to give it a personalized touch. A sharpened pencil was also fixed to the second cover letter in the hope that recipients would immediately take the twenty minutes needed to fill out the survey. A pre-paid self-addressed return envelope was also included in the second mailing.

The first veneer mill survey with an enclosed pre-paid return envelope was mailed a few days after the initial mailing of the logger's survey was completed (Appendix C.3). A cover letter was sent with the survey explaining the research project, how the veneer producers were selected, the voluntary nature of the survey, and the confidentiality of the results (Appendix C.2). The surveys were addressed to the contact person listed in the states' primary producer guides. The returned personalized surveys prevented accidental re-mailing of reminders to respondents. Three weeks after the initial mailing, a postcard reminder was sent to all non-respondents (Appendix C.6). When an additional three weeks had passed, a second survey complete with a new cover letter was mailed to all non-respondents (Appendix C.7). Because there were only thirty-eight veneer mills in total, it was feasible to contact by telephone all non-respondents and ask for their cooperation in this project. After an additional three weeks had passed, personalized letters with a third copy of the veneer mill survey was mailed to all non-respondents along with a sharpened pencil and a pre-paid return envelope (Appendix C.9). A second round of telephone calls was placed in an attempt to convince non-respondents to take the time and return a completed survey. In many cases only the office manager could be

reached and a message was left asking for the contact persons cooperation in filling out and returning the survey.

Data Analysis

Returns and non-returns were analyzed for each state. Even though the survey procedures included persistent efforts to reduce non-response, some non-response was expected to occur. There are several methods available to deal with non-response and check for bias. In the logger's survey wave analysis was the method used to check for response bias. This method determined if responses changed substantially from week to week as the surveys were returned. Non-response analysis of the veneer mill survey consisted of an examination of the business characteristics of non-responding mills. For example, the non-response of large veneer producers with considerable market power would have a greater potential impact on the statistical significance of the survey results than the non-response from a small veneer producer.

A descriptive statistical analysis of all independent and dependent variables was conducted. Nominal measures are reported as percentages. Ordinal measures include the central tendency (mean) and the dispersion statistics such as the standard deviations. The software used to analyze data collected was Statistical Package for Social Scientists (SPSS 1997).

Chapter 4

Results and Discussion

The discussion that follows is a presentation of the results for the two surveys described in Chapter 3. A description of the respondents for both surveys is followed by the results that are presented by the objectives defined in Chapter 1. Additionally, responses to questions concerning the export markets are reported as is the section regarding industry trends which was included in the veneer mill survey.

In order to provide useful information about the variables from the frequency distributions reported, statistics provide measures of central tendency. Three useful measures of central tendency are the mode (the most frequent value), the arithmetic mean (average), and the median (the middle attribute). This chapter will focus on comparing means. Babbie (1996) reports that averages have the special advantage of reducing raw data to its most manageable form, a single number. Further, Babbie (1996) notes that the disadvantages of averages can be alleviated somewhat through the reporting of summaries of the dispersion of responses. The measure of dispersion used in this thesis is the standard deviation. The standard deviation is the square root of the variance, which means it is in the same units as the raw data and tells us the extent to which the answers are concentrated around the mean. For example, a standard deviation of zero means all the scores are the same, low standard deviations are interpreted as little variability from the mean, and high standard deviations result from greater variability from the mean.

Of the 38 veneer mills listed in the primary producer guides mailed the survey, it was determined that three facilities were classified incorrectly and one had gone out of business. Four veneer mills, owned by one corporation, were treated as one survey

because the respondent was in charge of log procurement for all four operations. Therefore, 27 mills responded to this survey representing an 87% overall response rate (N=31). Of these, one mill did not fill out the survey noting they do not deal with high-grade veneer logs. Subsequently, 26 usable surveys were available for analysis representing an 87% overall response rate (N=30).

Forty-seven logger's surveys were returned as undeliverable representing 3% of the population (N=1481). A total of 596 logger surveys were returned representing slightly greater than 40% of the population. Of these, 216 respondents representing 14% of the population answered no to the filter question indicating that they are not involved in the veneer log business at this time. The resulting 380 usable logger surveys available for analysis represent a 25% overall response rate (N=1481).

Industry professionals with different amounts of time on the job may have different opinions as to the status of the resource. Therefore both surveys asked the number of years of experience in veneer log procurement of the respondents. Slightly less than 70 percent of mill respondents have at least 21 years in veneer log procurement (Table 13). When compared to the veneer mill survey, only 36.3 percent of responding loggers have at least 21 years of experience while the largest group, those with 11 to 21 years experience, represent 38.7 percent of the total (Table 14).

The first objective of this research was 'to measure the attitudes and perception of availability of hardwood face veneer logs among industry log buyers and logging professionals. Survey questions 7 and 8 were designed to measure respondents attitudes regarding factors affecting domestic availability for the veneer mill and loggers survey respectively. These factors were increased international demand, conflicting landowner

objectives, urban development, forest-land fragmentation, property turnover, absentee ownership, parcel size, previous high-grading, environmental regulations, and mistrust of loggers. A Likert scale measuring relative importance offered respondents the choice very important, somewhat important, neutral, somewhat unimportant, and very unimportant.

Increased international demand was the factor considered most important to domestic availability by both groups (Tables 15 and 16). When queried about the relative importance of international demand, sixteen veneer mill respondents (64%) reported this factor very important while seven (28%) considered this somewhat important.

Respondents to the logger's survey answered similarly as indicated by the 179 respondents (49.6%) who answered very important and the 132 (36.6%) who considered this somewhat important.

Respondents from both groups held similar opinions regarding the relative importance of previous high grading and considered this factor second most influential to the domestic availability of veneer logs. Eleven veneer mill respondents (44%) answered that this factor is very important while an additional 11 (44%) answered somewhat important. Similarly 161 respondents (44.8%) from the logger's survey answered that this factor is very important while 131 respondents (36.5%) answered somewhat important.

Veneer mill respondents ranked increased environmental regulations as the third most important factor. Twelve respondents (48%) reported this factor as very important while nine respondents (36%) answered somewhat important. Differing on this factor, respondents to the logger's survey ranked increased environmental regulations eighth in importance behind landowner mistrust of loggers, increased forest-land fragmentation,

conflicting landowner objectives, decreasing parcel size, and urban development.

Ranking the relative importance of owner mistrust of loggers the third most important factor, 147 loggers (40.7%) answered very important while 115 respondents (31.9%) answered somewhat important.

The factor considered least important by both groups was increasing absentee ownership. Only two veneer mill respondents (8%) answered that this factor is very important while 12 respondents (48%) answered somewhat important. Similarly, 40 responding logger's (11.6%) answered that this factor is very important and 103 respondents (29.9%) answered somewhat important.

The means for the independent variables measuring attitudes and perception of domestic availability for veneer mill respondents ranged from 1.44 to 2.36 (Table 17). The mean score for a variable indicates relative importance where a score of 1= very important, 2= somewhat important, 3= neutral, 4= somewhat unimportant and 5= very unimportant. Mean scores of less than two indicate that the central tendency leans toward very important. This confirms that 'increased international demand' (1.44), 'previous high-grading' (1.68), and 'increased environmental regulations' (1.72) are the independent variables with central tendencies leaning toward very important by veneer mill procurement specialists. The variable 'absentee ownership' was reported as least important (2.60), and the mean reveals respondent's attitudes tend toward neutrality. The standard deviations are consistently low to moderate for these variables (Table 17).

The means and standard deviations for the independent variables measuring attitudes and perception of domestic availability from the logger's survey results are reported in Table 18. 'Increased international demand' (1.69), 'previous high-grading'

(1.81), and 'owner mistrust of loggers' (1.98) are the independent variables seen as very and somewhat important by logging professionals. The other variables measured are somewhat important. The variable reported as least important was 'increasing absentee ownership' (2.72), which reveals respondent's attitudes tend toward neutrality. The standard deviations for the variables measured generally report moderate variability around the means (Table 18).

The second research objective was 'to determine the factors which are perceived to be contributing to scarcity of the veneer log resource.' Respondents were asked to indicate to what extent they agreed or disagreed with several statements about veneer logs in order to quantify the factors perceived to be contributing to scarcity. Variables measured were location of veneer timber, time in procurement, high-grading and selection harvests, management plans on NIPF lands, whole tree chipping, standardization of tree grades, sustainability of current harvest rates, and the relationship of price to availability. The Likert scale from which respondent attitudes were measured was strongly agree, agree, neutral, disagree, and strongly disagree. The statements were presented in Questions 6 and 7 respectively on the veneer mill and loggers surveys.

Veneer mill respondent's perceptions regarding the statement "the amount of time spent in procurement for veneer log buyers is increasing" reveals that slightly greater than 92% of respondents believe it is (Table 19). Twelve respondents (46.2%) strongly agreed and twelve respondents (46.2%) agreed. Similarly the survey results shows that the dominant perception among loggers is also agreement (Table 20) as 79.2% of loggers either strongly agreed or agreed with this statement. Table 21 and 22 respectively report the means and standard deviations for the factors perceived to be contributing to scarcity

for the veneer mill and logger surveys. Respondents mean score for this statement was 1.65 for the mill survey and 1.96 for the logger survey confirming the central tendency is toward strongly agree.

Both groups of survey respondents generally agree that “whole tree chipping is decreasing the next generation of veneer logs” (Table 19). Of veneer mill respondents 58.9% either strongly agreed or agreed while 63.8% of loggers concur (Table 20). The means for this statement were 2.34 and 2.31 for the mill and logger groups respectively. Similar frequency and percent statistics were recorded for the statement “selection harvesting for veneer promotes high-grading and stand degradation” for both groups. However the mean for the veneer mill survey (2.80) tended toward neutrality while the logger group (2.41) still leaned toward agreement.

Additionally, respondents perceptions tended toward agreement with the statement ‘quality veneer logs are obtainable if we are willing to pay higher prices’ contradicting the notion of physical scarcity but supporting the idea of economic scarcity. The veneer mill mean (2.50) was similar to the logger mean (2.61) and was about half way between agree and neutral. The respective standard deviations (.98 and 1.09) show moderate variation around the mean. Similar results were recorded for the statement ‘standardized tree grade between the U.S. Forest Service and industry are necessary.’

Regarding a statement that contradicts Forest Service FIA results, ‘the majority of standing timber of veneer quality suitable for face veneer is located on public timberland withdrawn from harvest or reserved on other lands that do not permit timber harvests,’ veneer mill respondents were almost evenly divided. Loggers tended toward agreement on this incorrect statement. The mean for the veneer mill survey (3.03) demonstrates the

respondent's central tendency toward neutrality. The standard deviation (1.11) showed moderate variability around the mean. The logger survey (2.61) recorded a mean score about half way between agree and neutrality. The standard deviation (1.18) showed moderate variability around the mean.

The frequency and percent statistics for veneer mill respondents slightly leaned toward disagreement with the statement "the current harvesting of veneer is being done at sustainable cutting rates" while loggers leaned toward agreement. However the means showed strong neutrality for the mill group (3.15) and a central tendency toward neutrality for the loggers (2.88).

The statement 'management plans should be required on non-industrial private forest lands' would presumably promote better forest management and thereby a superior future veneer supply. However the majority of veneer mill respondents were in disagreement with this statement as nine (34.6%) disagreed and six strongly disagreed (23.1%). Similar to the mill survey, the majority of loggers were in disagreement with this statement as 69 respondents (18.8%) disagreed and 127 strongly disagreed (34.6%). The mean for mill respondent's (3.57) indicated this tendency toward disagreement. The standard deviation (1.13) showed moderate variability around the mean. Similarly, the mean for logger's (3.45) indicated that respondents were strongly neutral leaning toward disagreement. The standard deviation (1.42) shows greater variability around the mean.

To help determine the factors which are perceived to be contributing to scarcity of the veneer log resource, Questions 8 and 9 were designed to quantify certain market characteristics perceived to be contributing to veneer log scarcity. Variables included establishing uniform veneer log grades, standardizing veneer product grades, banning

hardwood log exports, promoting character marked wood, competition from substitute products, marketing odd species, and log color. A Likert scale designed to measure the relative importance of these market characteristics offered respondents the choice very important, somewhat important, neutral, somewhat unimportant, and very unimportant.

Veneer mill respondents ranked 'competition from substitute products' as the most important market characteristic (Table 23). Eight respondents (33.3%) reported this market characteristic as very important and 13 respondents (54.2%) thought it was somewhat important representing greater than 87 percent of respondents. Similarly, mill respondents ranked the relative importance of 'log color' highly as 80 percent of respondents answered either very important or somewhat important. The means for the market characteristics 'competition from substitute products' (1.83) and 'log color' (1.84) reveal this trend in respondent's perceptions. The respective standard deviations reported (.76 and .85) show low variability around the mean. In the logger's survey 'log color' was ranked as the most important market with a mean (1.89) indicating a central tendency between somewhat and very important (Table 24). The standard deviation (.93) shows little variability around the mean. The means for 'competition from substitute products' (2.25), 'establishing uniform veneer log grades' (2.20), and 'marketing efforts aimed at odd species' (2.27) all showed central tendencies toward somewhat important. To a slightly lesser degree, responding loggers similarly reported the relative importance of the characteristic 'standardizing veneer product grades' (mean = 2.30).

The veneer mill respondents' attitudes toward 'promoting character-marked wood' tended toward somewhat important. Five respondents (20%) reported this market characteristic as very important and 14 respondents (56%) answered somewhat

important. The mean (2.16) indicates this view and the standard deviation (.94) shows moderate variability around the mean. Responding loggers ranked the relative importance of 'promoting character-marked wood' similarly (mean = 2.35).

Veneer mill respondents ranked the relative importance of 'marketing efforts aimed at odd species' above the characteristic 'establishing uniform veneer log grades' or 'standardizing veneer product grades.' The mean for the characteristic 'marketing efforts aimed at odd species' (2.56) reveals a central tendency half way between somewhat important and neutral. Respondent's attitudes about the other two characteristics were reported as largely neutral. The reported means were 2.96 for 'standardizing veneer product grades' and 3.08 'establishing uniform veneer log grades.' The respective standard deviations (1.28 and 1.24) for these characteristics showed greater variability around the means. The characteristics 'establishing uniform veneer log grades' and 'standardizing veneer product grades' were proposed by the Forest Service in the early 1960's as an effective measure to resolve quality controversies.

Responding loggers' attitudes about the characteristic 'banning hardwood log exports' is largely neutral (mean = 2.91) and the standard deviation (1.40) shows significant variability around the mean. The comment section of the survey results revealed confusion among respondents on the question wording. This indicates failure of pre-testing for this question.

Quality, Quantity, and Future Price

Objective three was 'to measure the attitudes of industry professionals regarding the quantity and quality of available supply.' Question 3 on the veneer mill survey and Question 4 on the logger survey measured the respondent's perception of quality.

Perceptions were measured through a Likert scale constructed to measure whether respondent believed the resource was increasing, about the same, decreasing or don't know.

The majority of veneer mill respondents perceive the quality of red oak, white oak, and hard maple to be declining (Table 27). This group tends to perceive ash to be about the same. While none of the respondents answered that they think the quality of cherry or walnut veneer logs is increasing, the frequencies and percentages do not report a clear majority of respondents tending toward decreasing quality (Table 27). The veneer mill survey clearly shows that white oak (mean = 3.00) and walnut (mean = 3.25) respondents perceive decreasing quality (Table 29). The standard deviations for white oak (.72) and black walnut (.67) reflect moderate variability around the mean.

In contrast the means reported for the logger's survey strongly lean toward decreasing quality for white oak (2.82) and black walnut (2.88) (Table 30). To a lesser degree loggers tended to perceive black cherry (2.64) also to be decreasing. The mean for red oak (2.51) was directly in between about the same and decreasing. However, hard maple (2.37) in addition to ash (2.48) tended toward being about the same.

Attitudes Regarding Quantity

Respondents' perceptions regarding quantity was measured in Question 4 on the veneer mill survey and Question 5 on the logger survey. Respondents were queried regarding their beliefs about veneer logs in the small (11-15 inch), medium (16-20 inch), and large (21+ inch) diameter classes. The means for both are similar (Table 31 and 32).

In the veneer mill survey thirteen respondents (50%) answered that the quantity of veneer logs in the small diameter classes is increasing. Nine respondents (34.6%) answered that the quantity in the small diameter classes has remained the same. Three respondents (11.5%) answered the quantity in the small diameter classes is decreasing and one respondent (3.8%) answered don't know.

None of the respondents however, answered that the quantity of veneer logs in the medium diameter classes is increasing. Ten respondents (38.5%) answered that the quantity in the medium diameter classes has remained the same. Fifteen respondents (57.7%) reported that that the quantity in the medium diameter classes is decreasing. One respondent (3.8%) answered don't know.

No respondents reported that the quantity of veneer logs in the large diameter classes is increasing. One respondent (4.0%) answered that the quantity of veneer logs in the large diameter classes has remained the same. Fully 92 percent of the respondents, 23 survey respondents, believe that the quantity of veneer logs in the large diameter classes is decreasing. One respondent (4.0%) answered don't know (1 missing).

Regarding the frequency and percentage statistics for the logger survey 191 respondents (51.8%) answered that the quantity of veneer logs in the small diameter classes is increasing. One hundred and sixteen respondents (31.4%) answered that the quantity in the small diameter classes has remained the same. Forty-four respondents (11.9%) answered the quantity in the small diameter classes is decreasing and 11 respondents (4.9%) answered they don't know (11 missing).

Twenty-seven respondents (7.2%) answered that the quantity of veneer logs in the medium diameter classes is increasing. Two hundred and two respondents (54.2%)

answered that the quantity in the medium diameter classes has remained the same. One hundred and thirty four respondents (35.9%) reported that the quantity in the medium diameter classes is decreasing and ten respondents (2.7%) answered they don't know (11 missing).

Only ten respondents (2.7%) reported that the quantity of veneer logs in the large diameter classes is increasing. Thirty-six respondents (9.8%) answered that the quantity of veneer logs in the large diameter classes has remained the same. Fully 84.4% of the respondents (309) answered that the quantity of veneer logs in the large diameter classes is decreasing. Eleven respondents (3%) answered don't know (14 missing).

Real Price Trends

Rising real prices as an indicator of scarcity was discussed in Chapter 2. To further achieve objective three, respondents from both surveys were asked their opinions regarding the real price of veneer logs for each species group over the next ten years. Question 5 on the mill survey and Question 6 on the logger survey were designed to measure respondent's beliefs regarding future veneer log prices. Beliefs were measured through a Likert scale constructed to measure whether respondent believed the resource was increasing, about the same, or decreasing. This scale recorded the value one as increasing, two as about the same, and three as decreasing. The non-response frequencies in both surveys show a significant number of recipients chose to ignore this part of the question (Tables 33 and 34).

The mean scores for all species groups clearly show that respondents from both surveys central tendency heavily points toward future price increases (Tables 35 and 36).

For mill respondents the species group with the lowest reported mean (1.04) and standard deviation (.20) was hard maple indicating respondents strongly feel the future price of maple will rise. White oak (1.10), black cherry (1.14), red oak (1.13), and ash (1.26) all recorded mean scores leaning strongly toward price increases with standard deviations revealing small variability around the mean. The mean for black walnut (1.35) was the largest reported but still heavily pointed toward future price increases. Black walnut's standard deviation (.48) shows relatively little variability around the mean. Loggers responded similarly to all species except ash (1.57), which was between increasing and neutral.

The dominant belief for both groups is that real prices will increase for all species groups. But because the population of the mill survey is small (N=26), and so many respondents elected to ignore this section of the question, the usefulness of the mill averages are questionable. In the loggers survey however, the response is large enough to give us useful averages. In general terms, mill respondents predict prices to increase about twenty percent while loggers believe prices will rise slightly greater than one-third in real terms over the next ten years (Tables 37 and 38).

Future Availability

Question 10 on the logger's survey and 12 on the mill survey were designed to elicit respondents' opinions regarding factors important in determining future veneer log availability. These factors included forest management education programs, tax incentives on NIPF land, elimination of the estate tax, special capital gains taxes, uniform laws requiring best management practices, timber buyers certification, and funding

stewardship programs. A Likert scale allowed respondents to choose from very important, somewhat important, neutral, somewhat unimportant, and very unimportant.

Both groups reported 'increased forest management education programs' as the most important factor (Tables 39 and 40). Similarly, the three factors that dealt with tax issues were reported high in relative importance for both groups. The factor 'additional tax incentives for timber management on private lands' was the most important of the tax issues followed by 'special capital gains rates for timber investments.'

The mill survey included 'banning hardwood log exports' as a factor and the reported mean (2.32) indicates respondents central tendency is between somewhat important and neutral. As in the logger's survey, it must be noted that several respondents were confused about the question wording and applicable levels of importance to this factor indicating that this question failed in pre-testing.

To a greater degree the means for the remaining three factors tended toward neutrality for both surveys. The mean for the factor 'instituting uniform laws requiring best management practices' was 2.65 for the mill survey and 2.76 for the loggers. The means for the variable 'funding stewardship programs' was 2.61 for mill respondents and 2.49 for loggers. Finally, the relative importance of 'instituting timber buyers certification' was reported the least important factor by both groups. The mean for mill respondent's (3.03) shows that respondents are definitely neutral to this factor in determining future availability. The reported mean for responding logger's (2.72) shows a central tendency towards neutrality but still is somewhere between somewhat important and neutral. The standard deviation (1.40) reports significant variability around the mean.

The Export Markets

An export section was designed to elicit the opinions of veneer mill and logger respondents regarding the perceived impact of international markets on the veneer log resource. A filter question was asked to determine if the respondent produced or sold face veneer logs for international markets. For the veneer mill survey, eleven respondents (42.3%) reported that they export logs while the remaining fifteen respondents (57.7%) reported that they do not export logs (Table 43 and 44). Two respondents reported that they sell their export logs through a broker, ten respondents reported that they sell directly to international customers, and three respondents reported that they sell to other domestic veneer mills which in turn exports the logs.

For the logger survey, two hundred and fifty respondents (67.8%) reported that they export logs while sixty-nine respondents (18.7%) reported that they do not export logs. Fifty respondents (13.6%) answered they don't know. One hundred and forty-five of these respondents reported that they sell their export logs through a broker, 48 reported that they sell directly to international customers, and 150 respondents reported that they sell to other domestic veneer mills which in turn exports the logs.

Finally, Question 16 on the mill survey and 14 on the logger survey asked to what extent they agreed or disagreed with four statements regarding international demand. A Likert scale offered respondents the choices strongly agree, agree, neutral, disagree, and strongly disagree. Variables measured included government policy, foreign competition, world demand, and changed in species demanded.

Respondents from both groups tended to agree with the statement 'world demand for eastern hardwoods is strong and will continue to grow' (Tables 47 and 48). A

significant difference between both groups is reported for the statement 'the government policy of allowing unprocessed log exports is good for the economy.' The mean for mill respondent's (3.41) indicated strong neutrality drifting toward disagreement while the mean for logger's (2.43) generally reflects agreement. Both groups differed on the statement 'foreign competition for high quality logs is unfair to American producers.' Mill respondents were between agree and neutral (2.82) while loggers (3.50) were between neutral and disagree. Also loggers (2.43) tended toward agreement with the statement 'changes in species demanded result primarily from changes in foreign demand' while mill respondents (2.94) were neutral.

Industry Trends

The veneer mill survey included a section that did not appear on the logger's survey. Respondents perceptions regarding the industry trends were measured through a Likert scale designed to measure whether respondent felt the trend was increasing, about the same, decreasing, or don't know. This scale recorded the value one as increasing, two as about the same, three as decreasing, and four as don't know. These trends included veneer log volumes, industry profit margins, specialization, percentage of price increases to landowners, marketing, yield of architectural, panel, and furniture grade veneers, and customer acceptance of defects.

Regarding the status of the 'volume of veneer logs used' the mean (1.36) indicates respondents strongly agree the volume is increasing (Table 49). The standard deviation (.56) shows small variability around the mean (Table 50). Conversely, the mean for the trend 'veneer industry profit margins' (2.70) indicates respondents think that profit margins are decreasing. The standard deviation (.55) also shows small variability around

the mean. The mean for the trend 'specialization within the veneer industry' (1.56) is half way between increasing and about the same as is the mean for the trend 'percentage of price increases going to landowners' (1.56). The standard deviation (.71) for this trend shows greater variability around the mean.

The central tendencies for two industry trends were reported as being about the same. The means for the trends 'marketing efforts directed at niche markets' (1.92) and 'customer acceptance of veneer with more visible defects' (1.92) indicate that respondents tend to think these trends have remained the same. The respective standard deviations (.81) show moderate variability around the means.

When the three grades of veneer are compared, the mean for the trend 'the percentage of veneer logs yielding furniture grade veneer' (1.52) lies between increasing and about the same. The standard deviation (.82) shows moderate variability around the mean. The mean for the trend 'the percentage of veneer logs yielding panel grade veneer' (2.5) shows respondents central tendency is somewhere between about the same and decreasing, slightly leaning toward decreasing. The standard deviation (.71) shows moderate variability around the mean. The mean for the trend 'the percentage of veneer logs yielding architectural grade veneer' (2.70) shows respondents central tendency leans toward decreasing. The standard deviation (.75) also shows moderate variability around the mean.

Veneer mill respondents were asked if they are finding it more difficult to buy veneer grade logs. Nineteen respondents (76%) answered yes to this question. Four respondents (16%) answered no and two respondents (8%) reported they do not know (1missing).

A question regarding the implementation of business strategies was posed to respondents who had answered that they were finding it more difficult to buy veneer grade logs. Eleven respondents (42.4%) indicated that their firms have hired additional veneer log buyers as a business strategy. Fifteen respondents (57.7%) failed to answer this question. Thirteen respondents (50%) reported that their firm has installed new equipment as a business strategy while the remaining thirteen (50%) failed to answer this question. A comment section was made available to let respondents indicate what type of new equipment has been installed. New veneer press dryers, computer controls for the slicers, metal detectors, clipping equipment, and new knife grinders were among the technologies noted to increase efficiency. Three respondents (11.5%) noted that their firm was holding lower log inventories while the remaining twenty-three respondents (88.5%) failed to answer this question. Other comments included expanding the distance that buyers go to procure logs, purchasing from suppliers outside their region to keep the mill supplied, and difficulties in finding willing workers.

Respondents on both surveys were asked whether their customers want to know if the veneer logs they purchase come from sustainable forest management. Three mill respondents (11.5%) answered yes, twenty-two (84.6%) answered no, and one respondent (3.8%) answered don't know. Similarly, forty loggers (10.9%) answered yes, two hundred ninety-one (79.3%) answered no, and thirty-six (9.8%) answered don't know (13 missing).

Non-Response

As mentioned above, the veneer mill survey response rate was a strong 87%. Included among the twenty-seven mills that responded were the large business conglomerates with the most market power. Two firms in Indiana and two firms in Wisconsin failed to respond. The Wisconsin firms were rotary veneer producers and may have judged the survey inapplicable to their operations. The non-respondents in Indiana are small operations producing face veneer. While their input was desirable, no bias has been determined because of their non-response due to their small volume.

A non-response analysis of the logger's survey was conducted using a wave analysis. The first wave of surveys returned consisted of 275 responses, the second wave 66 responses, and the third wave 39 responses. Response frequencies for the respective waves were recalculated and compared to determine if bias exists between waves. Comparisons of the frequencies revealed no bias. For example, in Question four 42.2% of respondents in the first wave answered that red oak quality was about the same while respondents in the second and third waves answered 35.4% and 36.8% respectively. Further, the percentage of respondents who think large diameter logs is decreasing (question 5) was 83.9%, 83.9%, and 89.2% for waves 1, 2, and 3 respectively. Additionally, the wave analysis revealed that 70.8%, 64.5% and 72.7% of respondents believe the real price of hard maple (question 6) will increase for waves 1, 2, and 3 respectively. When asked if customers want to know if veneer logs originate from sustainable forest management (question 11), the wave analysis revealed that 78.9%, 80%, and 81.1% of respondents answered no for waves 1, 2, and 3 respectively.

Chapter three noted that the survey population was divided as follows: 568 loggers resided in Indiana, 435 Illinois, 386 Michigan, 28 Minnesota, and 64 Wisconsin. The Illinois and Indiana populations were derived from a state published licensed timber buyers list and contained buyers who resided outside those states. For the purpose of the non-response analysis they will be included in the state where they purchased their timber buyers license. Of the 435 surveys mailed to Illinois loggers, 76 usable surveys were returned representing a 17% response rate. Indiana loggers were mailed 568 surveys of which 143 usable surveys were returned representing a 25% response rate. Michigan loggers were mailed 386 surveys, of which 131 usable surveys were returned representing a 34% response rate. Minnesota loggers were mailed 28 surveys, of which 8 usable surveys were returned, representing a 29% response rate. And finally, Wisconsin loggers were mailed 64 surveys, of which 22 usable surveys were returned, representing a 24% response rate. The comparably low response rate from Illinois loggers may reflect the fact that veneer is not a big part of the state's forest products economy as indicated by the presence of only one veneer production facility. The response rates from the other states are close enough to conclude no response bias exists between states.

Comment Section

The comment section of the logger's survey requested respondents to tell us anything else they felt we should know about the veneer log resource. One hundred and seventy-two respondents used the space provided to give us additional information. This represents 11.6% of the survey population and 45% of all returned surveys. One of the themes repeated in the comment section was that loggers hold consulting foresters in low

regard. Loggers generally feel that consulting foresters mark timber with their commission as the priority ignoring best management practices, essentially high-grading for higher commissions. For example, one respondent wrote "If the timber industry wants to do something responsible, eliminate the cutting of live healthy trees under 15" d.b.h., and have the foresters realize what a 15" tree is. They mark many trees too small themselves." Another respondent wrote, "Forestry dept. relies too much on consultant foresters thus marking timber based on money instead of forest management." A different respondent commented "I find that the average consulting forester is no better at marking timber than the average logger; in fact some are far worse. Our so called forestry professionals are high grading for bigger commissions, mark dangerous pull trees, and rarely come to a job they have sold." One respondent commented "consulting foresters are NOT as white as the driven snow as all newspaper and TV reports lead the general public to believe." Additionally one respondent commented "comment about certifying timber buyers- much more important to certify consultants or whoever is marking the trees."

State and USDA Forest Service personnel were generally praised for good management practices. One respondent commented "the state seems to do a good job marking their timber." Another commented "I feel there would be additional veneer available at present and in the future if US Forest Service foresters instead of wildlife and environmentalist personnel would be allowed to manage the land that is in the timber harvesting program." One respondent compared U.S. Forest Service foresters to consulting foresters by commenting "U.S. Foresters (not too bad) and consulting foresters (don't know nothing).

Government policy regarding the management of public timberlands however was criticized. For example one respondent wrote, “There seems to be a policy on the Ottawa National Forest to ‘Not’ harvest a large number of over mature, past their prime, and dying large trees. This takes away a large area of prime veneer growing land.” Another wrote “The state and Gov. owns many acres of which I believe more selective harvesting should occur. I see many grade trees that will be lost because of the unavailability of management contact!” Still another respondent commented that “There seems to be a mentality in the Forest Service not to manage the forests for the good of the forest, but for the highest money return. Untold millions of feet of logs are being wasted by letting them grow well past prime grade where they deteriorate into pulp grade.”

Several references to ‘best management practices’ (BMP’s) were written in the comment section. One respondent commented that “Any uniform laws requiring best management practices should be required of the state and federal forest first because it belongs to the public and they should practice what they preach.” Another commented “Continual high grading of smaller and smaller trees without regard for best management practices and regeneration will continue to deplete the veneer and grade log growing stock base. A requirement that all mills and brokers buy from sustainable forest management would be a good start. In the current system of supply and demand greed wins out over forest stewardship.” Still another respondent wrote “I feel veneer logs- especially in the species of hard maple, black cherry, red oak, and walnut will continue to become harder to find if the logging within the private sector is not controlled more strongly by BMP’s.”

Another dominant attitude was logger opposition to government regulation of private property. One comment stated “I feel we already have enough regulations and laws in Indiana.” Another stated “I feel we should avoid government intervention in the timber industry. Government laws and regulations often do more harm than good.” Additionally one respondent commented “there is too much government regulation now! We don’t need more regulations!” And another commented “We need government out of everyone’s business. Further one respondent commented “Education! Education! Not Laws!”

Several respondents wrote comments that support landowner education. For example, one respondent wrote “the best thing to help the veneer log resource is to educate the landowner to select harvest so there will always be good timber for the future.” Another respondent commented “The log industry as a whole needs to wake up. Loggers need to be educated on good forestry practices. Selective harvest not just high-grading or butcher jobs (clear-cut anything over 10” goes).” Still a different respondent commented “All parties concerned needs more education on when, how, and why trees should be harvested. To many times woods are being harvested that are not mature.”

The opinion that diameter limits are necessary on hardwood timber harvests was also expressed in the comment section. One comment stated “Far too many small trees are being harvested (20 inches and under on the stump). Another commented “Timber in our area is being cut way too small and a size limit should be put on all timber sales unless it’s for cleared ground for Ag product. A standard size of 18” or bigger at breast height should be regulated in order to inform the harvest of the future.”

Additionally, several respondents commented on the perceived impact of forest-land fragmentation. One respondent commented “When land changes owners the timber is cut to the bone to pay for the land and no future veneer coming on.” Another commented “I’m concerned that land contractors are buying ground heavily, then cutting the timber with no regard for timber management.” A respondent from southern Indiana commented “Timberlands are being chopped up and sold off decreasing our quantity of timber for development. Small parcels of timber ground is satisfactory, but when they divide large parcels up, usually the areas developed which is not good for our future timber demands.” Another comment stated “too much timberland is being sold in 5-20 acre plots for private building sites.” And a different respondent commented “We have a problem with subdivision of forest lands to build houses. That is a major problem.” One comment stated “Development has really taken a toll on the forest resource.”

Tests of Statistical Significance

Babbie (1995) reports that there is no scientific answer to the question of whether a given association between two variables is significant, strong, important, interesting, or worth reporting. However, Babbie (1995) notes that tests of statistical significance are widely reported in social scientific literature and among these analysis of variance (ANOVA) is frequently used. The purpose of these tests of significance is to provide a yardstick against which to estimate the significance of association between variables (Babbie 1995). This thesis will use analysis of variance and report relationships as statistically significant at the .05 level. At the 95% confidence interval or greater we assume that there is an association between the variables. No hypothesis testing will be

conducted on the results from veneer mill survey, as the population of that census was small.

Objective 1 was ‘to measure the attitudes and perception of availability of hardwood face veneer logs among industry log buyers and logging professionals.’ Respondents answering their job description as sawmill management, veneer log buyers, or consulting foresters (Question 3) were collapsed into a new category labeled non-loggers. Respondents who answered their job description as logger in addition to sawmill management, veneer log buyers, or consulting foresters were also put into the non-logger’s category. Answers from this new category were compared against those respondents who only answered logger as their job description.

To meet Objective 1, factors influencing domestic and future availability were measured in Questions 8 and 10 respectively. ANOVA tests were conducted to determine whether or not the respondent category loggers vs. non-loggers were statistically significant in explaining the variable ‘owner mistrust of loggers’ for loggers (Table 51 and 52). Regarding attitudes about factors influencing future veneer log availability, the ANOVA values indicate a difference between loggers and non-loggers responses for the variables ‘additional tax incentives for timber management on private lands’, ‘elimination of the estate tax’, and ‘instituting special capital gains tax rates for timber investments’ (Table 53 and 54).

Analysis of variance was performed to measure the significance of respondent category for several other factors that influence availability. The ANOVA tests indicated statistical significance for loggers vs. non-loggers for the statement ‘standardized tree grade between the Forest Service and industry are necessary’ (Table 55). The analysis of

variance test showed significance for respondent group for the statement ‘The majority of standing timber of quality suitable for face veneer is located on public timberland withdrawn from harvest or reserved on other lands that do not permit timber harvests’ (Table 56).

Analysis of variance also tested for Objective three: “to measure the attitudes of industry professionals regarding the quantity and quality of available supply.” The respondent group was statistically significant for perceptions about the quality of hard maple (Tables 59 and 60). ANOVA values for logger vs. non-logger perceptions about quantity shows statistical significance for both the medium (16-20 inch) size classes (Table 61).

Respondents were asked their opinions whether the price of the species under study would increase, remain the same, or decrease over the next ten years after being discounted for inflation. For none of the dependent variables tested was respondent group significant at the .05 level or less (Tables 62 and 63).

Chapter 5

Conclusions

This research supports Luppold and Dempsey's (1996) conclusion that no single explanation can explain the contradiction between industry's perception of decreasing availability and the Forest Service's documentation of increasing inventories. However, the survey results help to explain this disconnect, as it is related to the veneer log resource, by identifying which issues procurement specialists perceive to be most influential to quality, quantity, and availability. Consequently, while the results of this survey quantify this sense of a dwindling resource among loggers and veneer mill managers, they simultaneously reveal a pattern of dynamic social and economic pressures, which may largely be responsible for this perception.

The measurement of the factors designed to achieve Objective 1; 'to measure the attitudes and perception of availability of hardwood face veneer logs among industry log buyers and logging professionals,' reflect some of these social and economic dynamics. For instance, the means testing showed that the two factors cited by both groups as most important in influencing domestic availability were 1) international demand and 2) previous high grading. Regarding increased international demand, most economists view this as a positive result of the global economy. Further, in the export section, loggers largely disagreed that foreign competition is unfair to American producers indicating that they profit from this activity.

Concern over past or present high grading, a direct responsibility of the respondents, can be compared to the results for the statement 'management plans should be required on non-industrial private forest lands.' Means testing showed that most

respondents disagree with this solution to the high-grading problem although its implementation would ultimately result in improved stands of timber.

However, the results from the ANOVA analysis point to another important factor. The variable 'owner mistrust of loggers' was rated significantly different by loggers and non-loggers. On its own 'owner mistrust of loggers' negatively affects availability. But when combined with factors such as forest land fragmentation, conflicting landowner objectives, decreasing parcel size, frequent property turnover, urban development, and increasing absentee ownership, the perception of veneer log scarcity is increased because procurement is much more difficult. These changing ownership characteristics have real supply consequences for the veneer industry. Procurement specialists informed of these changes will increase their chances for success when buying standing timber. When ownership characteristics are viewed collectively the assertion that procurement professionals need the skills of public relations managers and social scientists seems convincing.

Mill respondents' third most important factor, 'increased environmental regulations,' also reflects the social and economic dynamics of the scarcity issue. Institutional factors such as restrictive environmental regulations can be costly to industry, but they represent a social demand for non-market amenities and indirectly support Stynes (1997) who asserts that forestland in the Lake States is undergoing a transition from commodity to amenity use. Regulatory uncertainty is a relatively new factor NIPF owners must consider in addition to wide market swings when evaluating forest investments and this influences availability (Argow 1996).

The variables mentioned above may offer some clarification for some of the results seen for Objective 2. For instance, the greater than 92% of respondents who agree that ‘the amount of time spent in procurement is increasing’ may view increasing physical scarcity as the logical explanation and dismiss the complex social and economic interactions previously listed. General agreement by respondents with the statement that ‘quality logs are obtainable if we are willing to pay higher prices’ supports the notion of economic scarcity.

Another statistically significant statement, ‘standardized tree grade between the Forest Service and industry are necessary,’ was shown to have greater relative agreement among loggers when compared to veneer mill respondents. Without the clarification standardization would provide, the veneer mills continue to derive considerable market power from the status quo. Therefore, it is not surprising that since the Forest Service proposed standardization in the 1960’s, the veneer sector has consistently resisted this for both tree grade and veneer grades (Haskell et al. 1963, Haskell 1963).

Means testing showed that the issue of log color, a site-specific quality indicator, was high in relative importance to both groups. This market characteristic, while indicative of the “artistic” nature of the veneer industry, illustrates how market power can play out. Anecdotally, loggers repeatedly complain of potential veneer logs being rejected because buyers state that the logs are the wrong color. Consequently, loggers have no known standard against which they can make comparisons and often accuse the buyers of rejecting the logs for various economic reasons (e.g. changes in demand).

The veneer industry shift toward the use and acceptance of small diameter logs has been well-established (Hair 1966; Hendricks 1967). Because the long-term market

dynamics do not indicate physical shortages, it could be hypothesized that the increasing supply of smaller diameter logs manufactured with advanced utilization technologies are satisfying demand. Objective 3, 'to measure the attitudes of industry professionals regarding the quantity and quality of available supply,' revealed that at least half of both survey groups concur with Forest Service FIA conclusions and believe that the quantity of veneer logs in the small (11-15 inch) diameter classes are increasing. Respectively, 92% and 84.4% of mill and logger respondents believe the veneer logs in the large diameter classes are declining directly contradicting FIA conclusions that increases are occurring in all diameter classes. However, ANOVA tests revealed that only for responses regarding the medium diameter classes (16-20 inches) was respondent category highly significant. The mean response for logs in the medium diameter classes was between about the same and decreasing.

The industry trend section of the veneer mill survey supports the literature that the veneer industry is becoming more efficient (Callahan 1990). Means testing revealed that the majority of respondents believe that the volume of veneer logs being used is increasing but industry profit margins are decreasing. Because logs are purchased on the Doyle log scale an incentive is built in to promote the use small diameter logs as compared to those in the medium or large diameter classes. The yield of veneer is significantly higher from small logs purchased on the Doyle log scale so the use of small diameter logs increases profit potential. This may account for veneer log buyers preference for smaller diameter logs and further support the perception that large diameter veneer logs are scarce. Further, respondents largely perceive that 'customer acceptance of veneer with more defects' is the same, indicating that the quality from the

current supply of small logs is satisfying the same demand as did previous supplies of larger logs.

One area that supports the respondents' contention that large diameter veneer logs are becoming scarce concerns the perception that 'the percentage of veneer logs yielding architectural grade veneer' is decreasing. Architectural veneer often has length, width, and clarity requirements that large diameter logs easily satisfy. Absent standardized grades however, it is difficult to contest Forest Service findings of increasing quality and quantity in the large diameter classes. Further, it is not likely that Forest Service FIA conclusions are incorrect regarding quality or quantity. The Forest Service and the states have addressed industry complaints and have significantly increased sample sizes, *improving* statistical accuracy. Additionally, the ANOVA tests regarding quality revealed that hard maple perceptions of scarcity were significantly different between both loggers and non-loggers. This species is in high demand both domestically and internationally and the economic pressure from strong demand is likely to be contributing to the perception of scarcity.

Measurement of factors designed to achieve Objective 4, 'to measure the beliefs of the population about future availability of the veneer log resource,' revealed the respondents' belief in the importance of 'increased forest management education programs.' Kuhns et al. (1998) note that non-industrial private forest owners are a diverse group with small individual impacts but with a large collective impact on forests and forestry. Additionally, amenity and non-income personal benefits such as scenic enjoyment, wildlife appreciation, or hiking are valued over income related benefits such as timber income. Changing demographics, such as increasing affluence and a more

educated population, add to the diversity among NIPF owners. Increased forest-land fragmentation makes education more difficult because the growing number of landowners may know less about forestry and have different motivations and different educational needs than did past owners (Kuhns et al. 1998). Other studies have shown property turnover rates have significantly increased and NIPF owners come with various and often 'conflicting objectives' (DeCoster 1998). Kuhns et al. (1998) note that the average parcel size is moving toward 17 acres and decreasing parcel size makes it more difficult to be economically efficient in the production of hardwood veneer logs. Respondents may have ranked the need for 'increased forest management education' high in relative importance because they perceive that informed landowners are more willing to sell. However, there is ample evidence from previous studies to refute this position (Jones 1994).

Required management plans on NIPF lands received a negative assessment from respondents. Obviously professional foresters would play a major role in either education programs or the writing of management plans. However, the survey results indicate that private consulting foresters are not well respected by responding loggers. The logger's survey contained a comment section in which private consulting foresters drew considerable wrath as they are perceived to be marking timber largely for increased commissions as compared to marking timber for stand improvement. Conversely, state and Forest Service foresters received high marks in the comment section.

The three tax issues ranked high in relative importance to future availability among respondents. Respondent category was significant for the three tax variables in the ANOVA analysis for loggers vs. non-loggers (Tables 53. and 54). High property taxes

and estate taxes have been documented as causes of forest land fragmentation (Argow 1998). 'Additional tax incentives for timber management on NIPF lands' and 'a special capital gains tax rate for timber investments' were reported higher in relative importance than the 'elimination of the estate tax.' This reflects respondents' preference for market based solutions such as 'increased forest management education' as opposed to regulatory solutions such as required management plans or instituting timber buyers certification.

Implications and Recommendations

The perception of veneer log scarcity is likely to continue to grow in the near future. Decoster (1998) reports that nationwide there are about 146,000 more ownership's created from a basically static forest-land base every year and most of these pieces come from the midsize ownership's of 100-500 acres. This fragmentation increases the difficulty of log procurement and contributes to the perception of resource scarcity.

Rising real prices behave as an indicator of economic scarcity. These survey results indicate that veneer log buyers and loggers expect real prices to rise approximately 20-30% over the next ten years. The social and economic factors measured in Objectives one and two clearly would support the hypothesis of economic scarcity. To some degree it is surprising that factors which would act to alleviate the scarcity issue, such as standardization, required management plans, or timber buyer certification, ranked low in relative importance. However, both survey populations have a history of being independent and the tendency to prefer market based solutions is understandable.

Several other factors indicate that the issues involved in this study will continue to be controversial into the foreseeable future. For example, the predicted reduction of clear-cutting as a management tool and the increased reliance on selection harvests is likely to make the hardwood quality controversy worse (Resh 1994). Respondents from both surveys reported previous high-grading high in relative importance and loggers tended toward agreement that selective harvesting for veneer promotes high grading and stand degradation. From an economic perspective it reflects the tendency to place short run profit motives before long run management strategies. If the trends identified in Objectives 1 through 4 (ie. increased international demand, increased importance of log color) continue and demand remains strong, the pressure to purchase large volumes of quality logs may act to disconnect buyers from stewardship while the trend among the new NIPF's landowners is toward increased stewardship values (Tyson et al. 1998). Furthermore, procurement pressure in regions where species with the desired attributes are known to grow will increase, competition will continue to drive the prices upward, and buyers driving longer distances to procure in these regions may again equate more time on the road with dwindling supply.

The opportunities for economic development in the forest products sector in the study area are enormous due to plentiful supplies of eastern hardwoods. However, many other opportunities including recreation and tourism will continue to compete for the resource. In competitive markets resources theoretically move to the highest valued use. There is abundant evidence that high quality veneer logs are economically scarce. Conclusions that the resource is physically scarce may actually reflect that the resource was historically undervalued and in some cases amenity value now exceeds commodity

value. Forest Service timber supply projections through the year 2040 predict continued nationwide reductions in timberland area (Haynes et al. 1995). This will act to put increasing pressure on available supply as competition for the resource intensifies.

A greater degree of cooperation between the veneer sector and the Forest Service FIA unit is necessary if the quality issue is to be resolved. It is imperative that quality is defined and that industry's perception of quality is consistent with the resource. Currently, the desired homogenous look completely free of any blemish or discoloration seems inconsistent with the veneer resource and character marked wood should be included in any standardization program. Even though there are market considerations that would be difficult to address through veneer log and product standardization, no realistic solution can be advanced without it. With standardization the Forest Service could report veneer grades in the inventory process. A positive contribution that the Forest Service could make is to report measures of availability. Additionally, since 96% of veneer mill respondents and 84% of the loggers perceive veneer logs in the large diameter class to be decreasing, agencies should revisit this issue. Perhaps the Forest Service could report the estimated percentage of veneer contained in each diameter class of tree Grade One.

The rapid increase in the numbers of forest owners presents both new opportunities and new challenges for forestry professionals. Landowner education will be the key to the future success of the nation's hardwood resource. The increase in forest owners also supports Stynes (1997) assertion that the forested regions of the Lake States are undergoing a transition from commodity to amenity uses. The survey results further support this as reflected in the increasing procurement difficulties reported by 76% of the

veneer mills. Tyson et al. (1998) note the importance of knowing rather than making assumptions regarding NIPF owners and this will become more difficult as diversity in ownership increases. Extension services must address the needs of the new and changing forest owners in addition to their traditional farm clients. Management plans will play an increasingly important role and represent greater business opportunities for foresters. Industry should reconsider the potential benefits timber buyer certification presents when dealing with a diverse NIPF group. Finally, certification is a credential that can act to inform NIPF owners that buyers are educated in 'best management practices' consistent with good stewardship.

APPENDICES

Appendix A.1

Tree Species Groups

<u>State</u>	<u>Common Names</u>	<u>Scientific Names</u>
	<u>Select White Oaks</u>	
Mi., Mn., Wi., Il., In.	White Oak	<i>Quercus alba</i>
Mi., Mn., Wi., Il., In.	Bur Oak	<i>Quercus macrocarpa</i>
Mi., Il., In.	Chinkapin Oak	<i>Quercus muehlenbergii</i>
Mi., Mn., Ws., Il., In.	Swamp White Oak	<i>Quercus bicolor</i>
Il., In.	Swamp Chestnut Oak	<i>Quercus michauxii</i>
	<u>Select Red Oaks</u>	
Mi., Mn., Wi., Il., In.	Northern Red Oak	<i>Quercus rubra</i>
Il., In.	Cherry Bark Oak	<i>Quercus falcata</i> var. <i>pagodifolia</i>
In.	Shumard Oak	<i>Quercus shumardii</i>
	<u>Hard Maples</u>	
Mi., Mn., Wi., Il., In.	Black Maple	<i>Acer nigrum</i>
Mi., Mn., Ws., Il., In.	Sugar Maple	<i>Acer saccharum</i>
	<u>Ashes</u>	
Mi., Mn., Wi., Il., In.	White Ash	<i>Fraxinus americana</i>
Mi., Mn., Wi., Il., In.	Black Ash	<i>Fraxinus nigra</i>
Mi., Mn., Wi., Il., In.	Green Ash	<i>Fraxinus pennsylvanica</i>
Il., In.	Blue Ash	<i>Fraxinus quadrangulata</i>
Mi., Mn., Wi., Il., In.	<u>Black Walnut</u>	<i>Juglans nigra</i>
Mi., Mn., Wi., Il., In.	<u>Black Cherry</u>	<i>Prunusn serotina</i>

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Appendix A.2

Sampling Errors

Sampling errors for all species of saw-timber by state and survey date.

<u>Item</u>	<u>State Totals</u>	<u>Sampling Error</u>
Saw-timber	(Million board feet)	(percent)
<u>Michigan</u>		
Volume (1993)	70,971.2	0.94
Average annual growth (1980-1992)	2,665.2	1.06
Average annual removals (1980-1992)	776.5	4.73
<u>Minnesota</u>		
Volume (1990)	34,906.5	1.02
Average annual growth (1977-1989)	1,312.2	1.45
Average annual removals (1977-1989)	515.4	6.03
<u>Wisconsin</u>		
Volume (1996)	48,020.4	1.09
Growth (1996)	1,680.5	1.67
Removals (1996)	986.1	3.72
<u>Indiana</u>		
Volume (1986)	19,224.2	1.86
Growth (1985)	729.1	5.47
Average annual removals (1966-1985)	314.0	5.68
<u>Illinois</u>		
Volume (1985)	17,494.6	2.50
Growth (1985)	437.1	5.27
Removals (1985)	308.8	18.14

Source: Leatherberry and Spencer, 1996; Miles et al., 1995; Schmidt, 1997; Smith and Golitz, 1988; and Hahn, 1987.

Appendix B.1.

Price Data

Hardwood Lumber Prices, FAS Grade, 1976-1995.

YEAR	PPI	Ash Lumber Price in 1982 dollars	Cherry Price in 1982 dollars	Maple Lumber Price in 1982 dollars	Red Oak Price in 1982 dollars	Walnut Price in 1982 dollars
1976	56.5	735	832	596	693	2035
1977	60.6	685	872	602	685	1898
1978	64.9	798	1038	591	722	1829
1979	73.5	769	1020	544	687	1907
1980	87.1	649	861	448	580	1653
1981	96.1	568	780	412	536	1498
1982	100	530	750	390	530	1440
1983	101.2	609	742	385	610	1423
1984	102.2	714	756	386	678	1441
1985	103.3	634	752	378	686	1489
1986	98.5	621	797	396	740	1589
1987	100.7	628	807	405	748	1572
1988	103.1	731	921	461	786	1557
1989	108.9	756	886	459	748	1474
1990	115.3	677	837	434	707	1392
1991	118.7	588	816	429	687	1352
1992	120.8	563	822	541	698	1329
1993	121.7	559	879	711	778	1322
1994	121.6	578	938	720	812	1328
1995	124	616	975	701	827	1277

Source: Purchased from The Hardwood Market Report 1997.

Appendix C.1

Veneer Mills

	Company Name	Address	City	State	Zip	Telephone
1.	Swords Veneer & Lbr. Co.	37 th Ave. & 7 th St.	Rock Island	Ill.	61204	309-788-4515
2.	Indiana Veneer Products Corp.	321 S. Columbia	Montpelier	In.	47359	317-728-2439
3.	Jasper Veneers Inc.	E. 601 6th Street	Jasper	In.	47545	812-482-5022
4.	Adams Custom Veneer Co.	300 Culbertson Ave.	New Albany	In.	47150	812-945-2351
5.	B. L. Curry & Sons	1014 E. 6th Street	New Albany	In.	47150	812-945-6623
6.	Stemwood	2710 Grant Lane Rd	New Albany	In.	47151	812-945-6646
7.	Norstram Veneers	2990 Overlood Drive	Mauckport	In.	47112	812-732-4391
8.	Can-American Veneers Inc.	1001 West 2nd Street	Seymore	In.	47274	812-524-2262
9.	Amos- Hill Associates	P.O. Box 7	Edinburgh	In.	46124	812-526-2671
10.	Hoosier Veneer Corporation	P.O. Box 39	Trafalgar	In.	46181	317-878-4887
11.	David R. Webb Company	206 South Holland St.	Edinburgh	In.	46124	812-526-2601
12.	Curry Miller Veneers Inc.	3724 East 13th Street	Indianapolis	In.	46201	317-638-2326
13.	Indiana Veneers Inc.	1121 East 24th Street	Indianapolis	In.	46205	317-926-2458
14.	Thiesing Veneer Co.	300 Park Drive	Mooreville	In.	46158	317-831-4040
15.	Evansville Veneer & Lbr. Co.	100 S. Kentucky Ave.	Evansville	In.	47714	812-423-6491
16.	Conner Forest Ind. Inc./Wakefld	Hwy. M-38 W.	Baraga	Mi.	49908	
17.	The Furniture Clinic	422 North Street	Edmore	Mi.	48829	
18.	J.A.S. Veneer & Lbr. Inc.	1300 W. 12 th Street	S. St. Marie	Mi.	49783	906-635-0710
19.	LaGrand Lbr. & Veneer	2335 Burton SE St.104	Grand Rapid	Mi.	49506	616-243-9031
20.	Manthei Inc.	5421 Manthei Rd.	Petoskey	Mi.	49770	616-347-4672
21.	Northern Michigan Veneers	P.O. Box 352	Gladstone	Mi.	49837	906-428-3313
22.	Timber Products Co.	P.O. Box 378	Munsing	Mi.	49862	906-452-6221
23.	Coldwater Veneer Inc.	548 Race Street	Coldwater	Mi.	49036	517-278-5676
24.	Louisiana Pacific Corp.	Hwy. M-95 S.	Sagola	Mi.	49881	906-582-7101
25.	TAFCOR	9919 Tudor Rd.	Berrien Spr.	Mi.	49103	616-471-2351
26.	Allenwood Products	9930 W. 69th St	Eden Prairie	Mn.	55344	612-944-7600

27.	Rajala Lumber	P.O. Box 578	Deer River	Mn.	56636	218-246-8149
28.	Birdseye Veneer Co.	145 W. main St.	Butternut	Wi.	54514	715-769-3912
29.	Bayland Veneer Inc.	1440 Cornell Rd.	Green Bay	Wi.	54313	414-434-6560
30.	Ike International Corp.	500 E. Maple St.	Stanley	Wi.	54768	715-644-5777
31.	Hatley Veneer Co. Inc.	701 Emmons ville Rd.	Hatley	Wi.	54440	715-446-3321
32.	Goodman Forest Ind. Ltd.	P.O. Box 130	Goodman	Wi.	54125	715-336-2311
33.	Weber Veneer & Plywood Corp.	E. Mauer St.	Shawano	Wi.	54166	715-526-3165
34.	Wisconsin Veneer & Plywood	Railroad St.	Matton	Wi.	54450	715-489-3611
35.	Birchwood Lumber & Veneer	48 E 8 th Street	Birchwood	Wi.	54817	715-354-3441
36.	Marion Plywood Corp.	222 S. Parkview Ave.	Marion	Wi.	54950	715-754-5231
37.	Birchwood Manufacturing Co.	38 E. Messenger St.	Rice Lake	Wi.	54868	715-234-8181
38.	Louisiana Pacific Corp.	606 Wilderness Drive	Mellon	Wi.	54546	715-274-2311

Source: Illinois, Indiana, Michigan, Minnesota, and Wisconsin Department of Natural Resources Primary producer guides.

Appendix C.2.

First Veneer Mill Cover Letter

March 23, 1998

Dear forestry professional,

We at Michigan State University's Department of Forestry would like to know your opinion about the status of the veneer log resource. Your opinion will be useful to us in determining the supply of veneer logs in the Lake States, Illinois and Indiana. The questions in this survey are directed at six fine hardwood species. These are red oak, white oak, ash, hard maple, black cherry, and black walnut. We are studying high grade veneer logs which are sliced for products such as panels, fine furniture, or architectural uses. Logs that are peeled for veneer are not the focus of this study.

You were chosen for this survey because your business is listed in the state primary producer guide as a veneer producer. Your participation in this survey is completely voluntary, but we urge you to participate to ensure that opinions of veneer producers are accurately represented. If you chose to participate, you may skip any questions you do not wish to answer and may stop the survey at any time. We expect this survey to take approximately 20 minutes of your time. The completed survey will be strictly confidential and your name will not be associated with any of your answers. Completing and returning this questionnaire will be taken as an indication of your voluntary agreement to participate.

If you have any questions about the project or the survey, please contact Jim Stevens at (517) 432-3353. Thank you very much for your help with these surveys!

Sincerely,

Jim Stevens
Assistant Professor

Mike McGuire
Graduate Research Assistant

Appendix C.3.

Veneer Mill Questionnaire

Q1. Which of the following best describes your type of operation?

Veneer Mill ☐ Concentration Yard ☐
 Sawmill ☐ Other _____
 Logging ☐

Q2. How many years have you been involved in the veneer industry? (*Check one*)

Less than 1 year ☐ 11 to 20 years ☐
 1 to 5 years ☐ 21 to 30 years ☐
 6 to 10 years ☐ More than 30 years ☐

Q3. Do you feel the **quality** of veneer logs for each of the following species in the Lake States, Illinois, and Indiana is: (*Check one box for each specie*)

	Increasing	About the Same	Decreasing	Don't Know
Red Oak	☐	☐	☐	☐
White Oak	☐	☐	☐	☐
Ash	☐	☐	☐	☐
Hard Maple	☐	☐	☐	☐
Black Cherry	☐	☐	☐	☐
Black Walnut	☐	☐	☐	☐

Q4. For each size class below, indicate whether you feel the **quantity** of veneer logs in the Lake States, Illinois, and Indiana is: (*Check one box for each class*)

Diameter Class (inches)	Increasing	About the same	Decreasing	Don't know
Small (11-15)	☐	☐	☐	☐
Medium (16- 20)	☐	☐	☐	☐
Large (21+)	☐	☐	☐	☐

Q5. Over and above inflation, in order to obtain the same quality and quantity of veneer logs for each of the following species in the Lake States, Illinois, and Indiana in the next ten years **price** will: (*Check one box for each specie*)

	Increase	Remain the Same	Decrease	By what percentage (fill in blank)
Red Oak	☐	☐	☐	_____
White Oak	☐	☐	☐	_____
Ash	☐	☐	☐	_____
Hard Maple	☐	☐	☐	_____
Black Cherry	☐	☐	☐	_____
Black Walnut	☐	☐	☐	_____

Q6. Please indicate to what extent you agree or disagree with each of the following statements about veneer logs. (*Check one box for each statement*)

Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
<u>SA</u>	<u>A</u>	<u>N</u>	<u>D</u>	<u>SD</u>
☐	☐	☐	☐	☐
The majority of standing timber of quality suitable for face veneer is located on public timberland withdrawn from harvest or reserved on other lands that do not permit timber harvests.				
☐	☐	☐	☐	☐
The amount of time spent in procurement for veneer log buyers is increasing.				
☐	☐	☐	☐	☐
Selection harvesting for veneer promotes high-grading and stand degradation.				
☐	☐	☐	☐	☐
Management plans should be required on non-industrial private forest lands.				
☐	☐	☐	☐	☐
Whole tree chipping is decreasing the next generation of veneer logs.				
☐	☐	☐	☐	☐
Standardized <u>tree</u> grade between U. S. Forest Service and industry are necessary.				
☐	☐	☐	☐	☐
The current harvesting of veneer is being done at sustainable cutting rates.				
☐	☐	☐	☐	☐
Quality veneer logs are obtainable if we are willing to pay higher prices.				

Q7. How important are each of the following factors to the domestic availability of veneer logs? *(Check one box for each factor)*

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Increased international demand	☐	☐	☐	☐	☐
Conflicting landowner objectives	☐	☐	☐	☐	☐
Urban development	☐	☐	☐	☐	☐
Increased forest land fragmentation	☐	☐	☐	☐	☐
Frequent property turnover	☐	☐	☐	☐	☐
Increasing absentee ownership	☐	☐	☐	☐	☐
Decreasing parcel size	☐	☐	☐	☐	☐
Previous high grading	☐	☐	☐	☐	☐
Increased environmental regulations	☐	☐	☐	☐	☐
Owner mistrust of loggers	☐	☐	☐	☐	☐

Q8. How important do you feel each of these market characteristics are to the veneer industry? *(Check one box for each issue)*

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Establishing uniform veneer log grades	☐	☐	☐	☐	☐
Standardizing veneer product grades	☐	☐	☐	☐	☐
Promotion of character marked wood	☐	☐	☐	☐	☐
Competition from substitute products	☐	☐	☐	☐	☐
Marketing efforts aimed at odd species (e.g. Sassafras)	☐	☐	☐	☐	☐
Log color	☐	☐	☐	☐	☐

Q9. Please indicate whether you think the following industry trends are increasing or decreasing. (Check one box for each item)

	Increasing	About the Same	Decreasing	Don't Know
Volume of veneer logs used	☐	☐	☐	☐
Veneer industry profit margins	☐	☐	☐	☐
Specialization within the veneer industry (e.g., custom slicing)	☐	☐	☐	☐
The percentage of the veneer log price increases going to landowners	☐	☐	☐	☐
Marketing efforts directed at niche markets (e.g., automobile dashboards)	☐	☐	☐	☐
The percentage of the veneer log's yielding architectural grade veneer	☐	☐	☐	☐
The percentage of the veneer log's yielding panel grade veneer	☐	☐	☐	☐
The percentage of the veneer log's yielding furniture grade veneer	☐	☐	☐	☐
Customer acceptance of veneer with more visible defects (e.g., gum, pin knots)	☐	☐	☐	☐

Q10. Are you finding it more difficult to buy veneer grade logs?
 Yes ☐ No ☐ Don't Know ☐

If you answered *No* to Q10, do not answer question Q11. Instead proceed to question Q12 and continue to the end of the survey. If you answered *Yes* to Q10, please check all strategies which apply in Q11.

Q11. Which of the following business strategies has your firm employed. (*Check all that apply*)

Our firm has hired additional veneer log buyers as a procurement strategy to solve supply issues. ☐

Our firm has installed new equipment technologies as a strategy to remain competitive. For example: ☐

Our firm is holding lower log inventories because of price increases of veneer logs. ☐

Other

Q12. How important do you feel each of the following factors are in determining future veneer log availability? (*Check one box for each factor listed*)

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Increased forest management education programs	☐	☐	☐	☐	☐
Additional tax incentives for timber management on private lands	☐	☐	☐	☐	☐
Elimination of the estate tax	☐	☐	☐	☐	☐
Institute special capital gains tax rate for timber investments	☐	☐	☐	☐	☐
Banning hardwood log exports	☐	☐	☐	☐	☐
Uniform laws requiring best management practices	☐	☐	☐	☐	☐
Institute timber buyers certification	☐	☐	☐	☐	☐
Funding stewardship programs	☐	☐	☐	☐	☐

Q13. Do your customers want to know whether the veneer logs originate from sustainable forest management? Yes ☐ No ☐ Don't Know ☐

Q14. Do you export veneer logs?
Yes ☐ No ☐ Don't Know ☐

If you answered *No* to Q14, do not answer questions 15 and 16. Instead proceed to question 17 and then return the survey in the self addressed stamped envelope provided. If you answered *Yes* to Q14, please check the category which best fits your export description and continue to the end of the survey. (*Check all that apply*)

Sell to broker ☐
Sell directly to international customers ☐
Sell to domestic veneer plants which export ☐

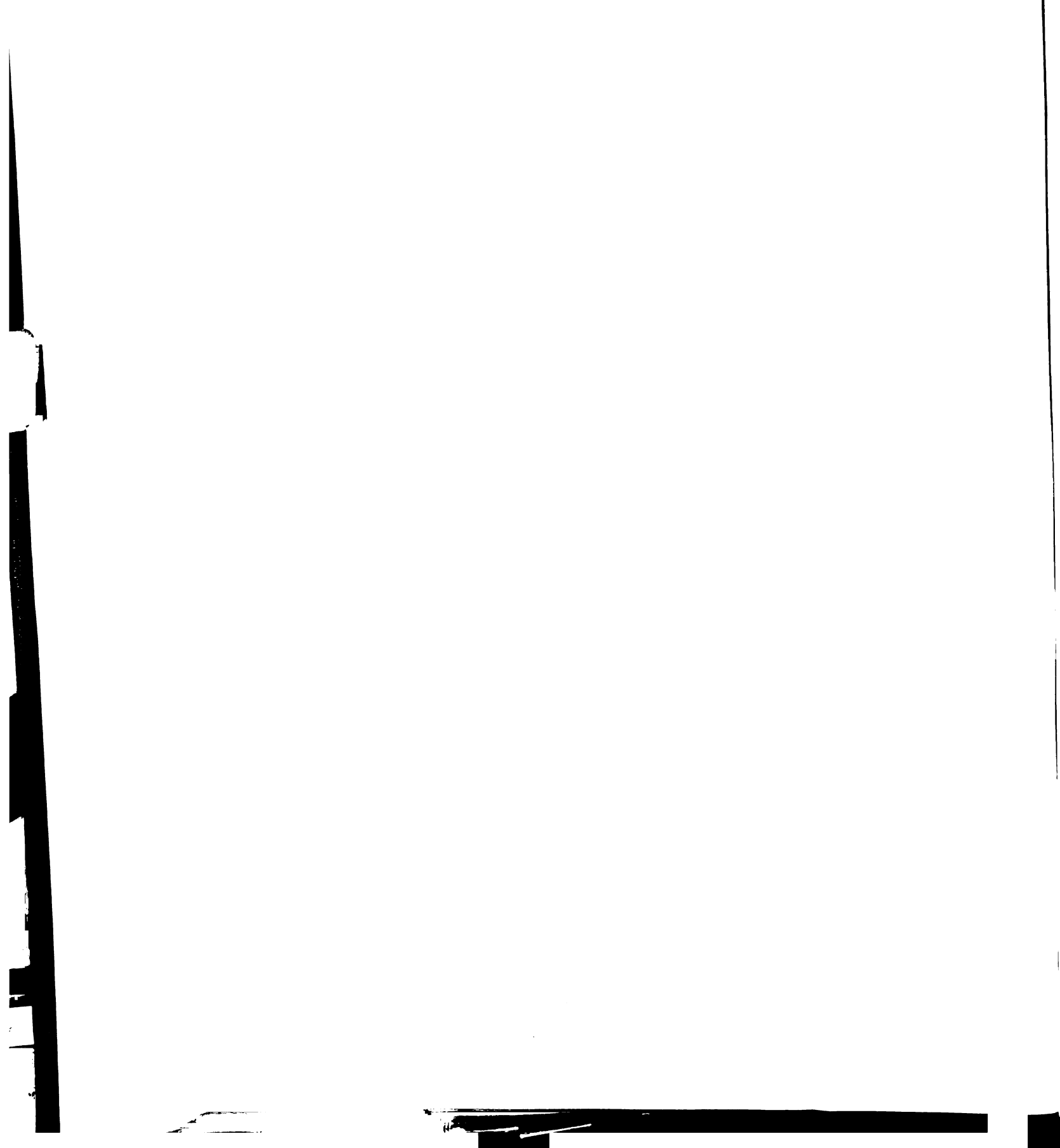
Q15. What percentage of the veneer logs you produce or purchase are exported? (*Check one*)

Less than 1 Percent ☐ 26 to 50% ☐
1 to 10% ☐ 51 to 75% ☐
11 to 25% ☐ 76 to 100% ☐

Q16. Please indicate to what extent you agree or disagree with each of the following statements about veneer log exports. (*Check one box for each statement*)

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

	SA	A	N	D	SD
The government policy of allowing unprocessed log exports is good for the economy.	☐	☐	☐	☐	☐
Foreign competition for high quality logs is unfair to American producers.	☐	☐	☐	☐	☐
World demand for eastern hardwoods is strong and will continue to grow.	☐	☐	☐	☐	☐
Changes in species demanded result primarily from changes in foreign demand.	☐	☐	☐	☐	☐



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Attach an additional page if you have more to say.

Appendix C.4.

First Loggers Cover Letter

March 23, 1998

Dear forestry professional,

We at Michigan State University's Department of Forestry would like to know your opinion about the status of the veneer log resource. Your opinion will be useful to us in determining the supply of veneer logs in the Lake States, Illinois and Indiana. The questions in this survey are directed at six fine hardwood species. These are red oak, white oak, ash, hard maple, black cherry, and black walnut. We are studying high grade veneer logs which are sliced for products such as panels, fine furniture, or architectural uses. Logs that are peeled for veneer are not the focus of this study.

You were randomly chosen from primary producer guides and licensed timber buyer lists produced by the states studied in this project. Your participation in this survey is completely voluntary, but we urge you to participate to ensure that opinions of forestry professionals are accurately represented. If you chose to participate, you may skip any questions you do not wish to answer and may stop the survey at any time. We expect this survey to take approximately 20 minutes of your time. The completed survey will be strictly confidential and your name will not be associated with any of your answers. Completing and returning this questionnaire will be taken as an indication of your voluntary agreement to participate.

If you have any questions about the project or the survey, please contact Jim Stevens at (517) 432-3353. Thank you very much for your help with these surveys!

Sincerely,

Jim Stevens
Assistant Professor

Mike McGuire
Graduate Research Assistant

Appendix C.5.

Loggers Survey

Q1. Are you involved in the veneer log business?

☐ Yes. (Continue below)

☐ No. (Please return uncompleted survey in the self addressed stamped envelope)

Q2. How many years have you been involved in veneer log procurement, sales, or consulting? (*Check one*)

Less than 1 year ☐

1 to 5 years ☐

6 to 10 years ☐

11 to 20 years ☐

21 to 30 years ☐

more than 30 years ☐

Q3. Which category best describes your job position. (*Check one*)

Logging ☐

Sawmill Management ☐

Other _____

Veneer Log Buyer ☐

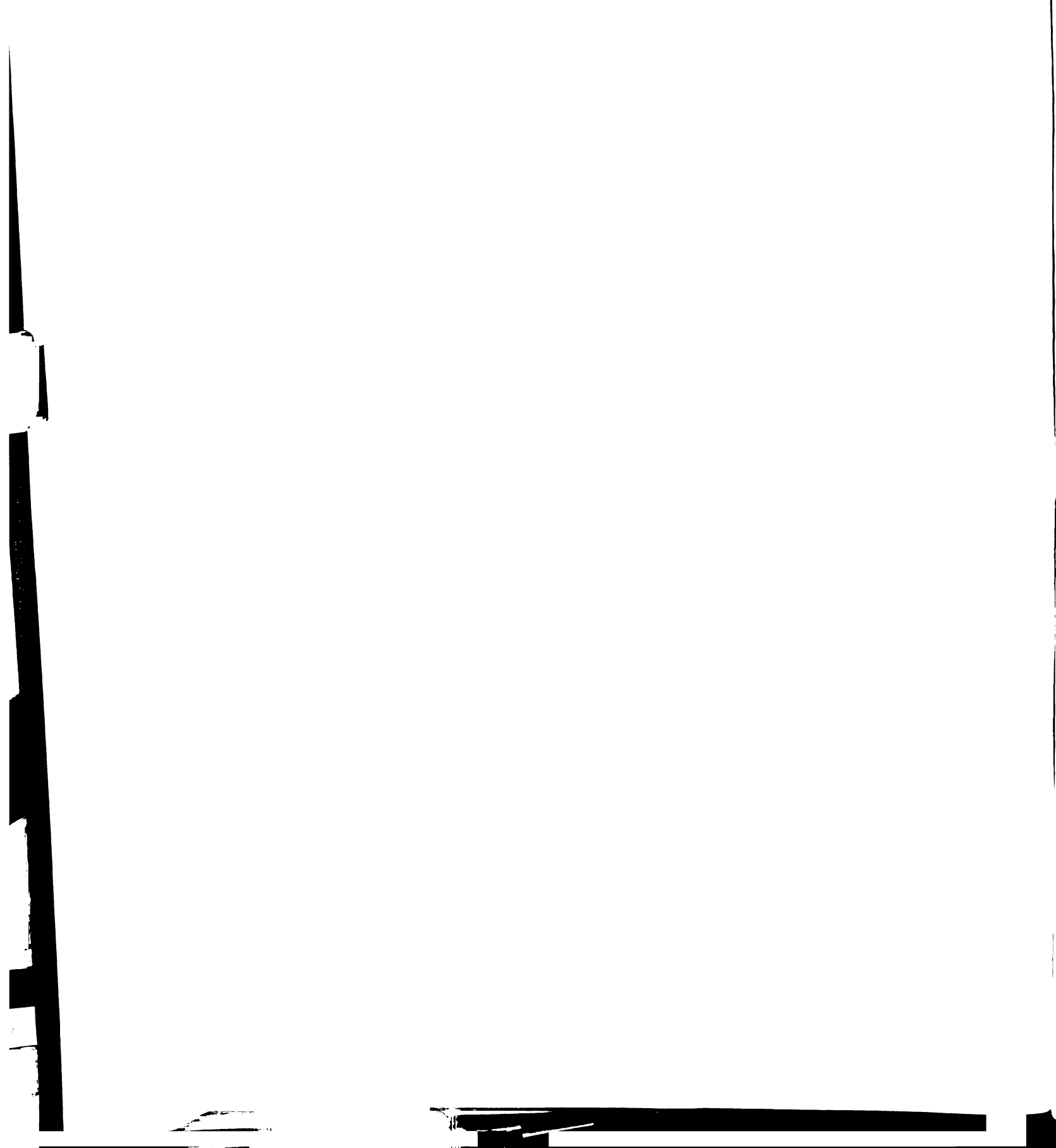
Consulting Forester ☐

Q4. Do you feel the *quality* of veneer logs for each of the following species in the Lake States, Illinois, and Indiana is: (*Check one box for each specie*)

	Increasing	About the Same	Decreasing	Don't Know
Red Oak	☐	☐	☐	☐
White Oak	☐	☐	☐	☐
Ash	☐	☐	☐	☐
Hard Maple	☐	☐	☐	☐
Black Cherry	☐	☐	☐	☐
Black Walnut	☐	☐	☐	☐

Q5. For each size class below, indicate whether you feel the *quantity* of veneer logs in the Lake States, Illinois, and Indiana is: (*Check one box for each class*)

Diameter Class (inches)	Increasing	About the same	Decreasing	Don't know
Small (11-15)	☐	☐	☐	☐
Medium (16- 20)	☐	☐	☐	☐
Large (21+)	☐	☐	☐	☐



Q6. Over and above inflation, in order to obtain the same quality and quantity of veneer logs for each of the following species in the Lake States, Illinois, and Indiana in the next ten years *price* will: (*Check one box for each specie*)

	Increase	Remain the Same	Decrease	By what percentage (fill in blank)
Red Oak	☐	☐	☐	_____
White Oak	☐	☐	☐	_____
Ash	☐	☐	☐	_____
Hard Maple	☐	☐	☐	_____
Black Cherry	☐	☐	☐	_____
Black Walnut	☐	☐	☐	_____

Q7. Please indicate to what extent you agree or disagree with each of the following statements about veneer logs. (*Check one box for each statement*)

	Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
	SA	A	N	D	SD
The majority of standing timber of quality suitable for face veneer is located on public timberland withdrawn from harvest or reserved on other lands that do not permit timber harvests.	☐	☐	☐	☐	☐
The amount of time spent in procurement for veneer log buyers is increasing.	☐	☐	☐	☐	☐
Selection harvesting for veneer promotes high-grading and stand degradation.	☐	☐	☐	☐	☐
Management plans should be required on non-industrial private forest lands.	☐	☐	☐	☐	☐
Whole tree chipping is decreasing the next generation of veneer logs.	☐	☐	☐	☐	☐
Standardized <u>tree</u> grade between the U S Forest Service and industry are necessary.	☐	☐	☐	☐	☐
The current harvesting of veneer is being done at sustainable cutting rates.	☐	☐	☐	☐	☐
<i>Quality</i> veneer logs are obtainable if we are willing to pay higher prices.	☐	☐	☐	☐	☐

Q8. How important are each of the following factors to the domestic availability of veneer logs? (*Check one box for each factor*)

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Increased international demand	☐	☐	☐	☐	☐
Conflicting landowner objectives	☐	☐	☐	☐	☐
Urban development	☐	☐	☐	☐	☐
Increased forest land fragmentation	☐	☐	☐	☐	☐
Frequent property turnover	☐	☐	☐	☐	☐
Increasing absentee ownership	☐	☐	☐	☐	☐
Decreasing parcel size	☐	☐	☐	☐	☐
Previous high grading	☐	☐	☐	☐	☐
Increased environmental regulations	☐	☐	☐	☐	☐
Owner mistrust of loggers	☐	☐	☐	☐	☐

Q9. How important do you feel each of these market characteristics are to the veneer industry? (*Check one box for each issue*)

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Establishing uniform veneer log grades	☐	☐	☐	☐	☐
Standardizing veneer product grades	☐	☐	☐	☐	☐
Banning hardwood log exports	☐	☐	☐	☐	☐
Promotion of character marked wood	☐	☐	☐	☐	☐
Competition from substitute products	☐	☐	☐	☐	☐
Marketing efforts aimed at odd species (e.g. Sassafras)	☐	☐	☐	☐	☐
Log color	☐	☐	☐	☐	☐

Q10. How important do you feel each of the following factors are in determining future veneer log availability? (*Check one box for each factor listed*)

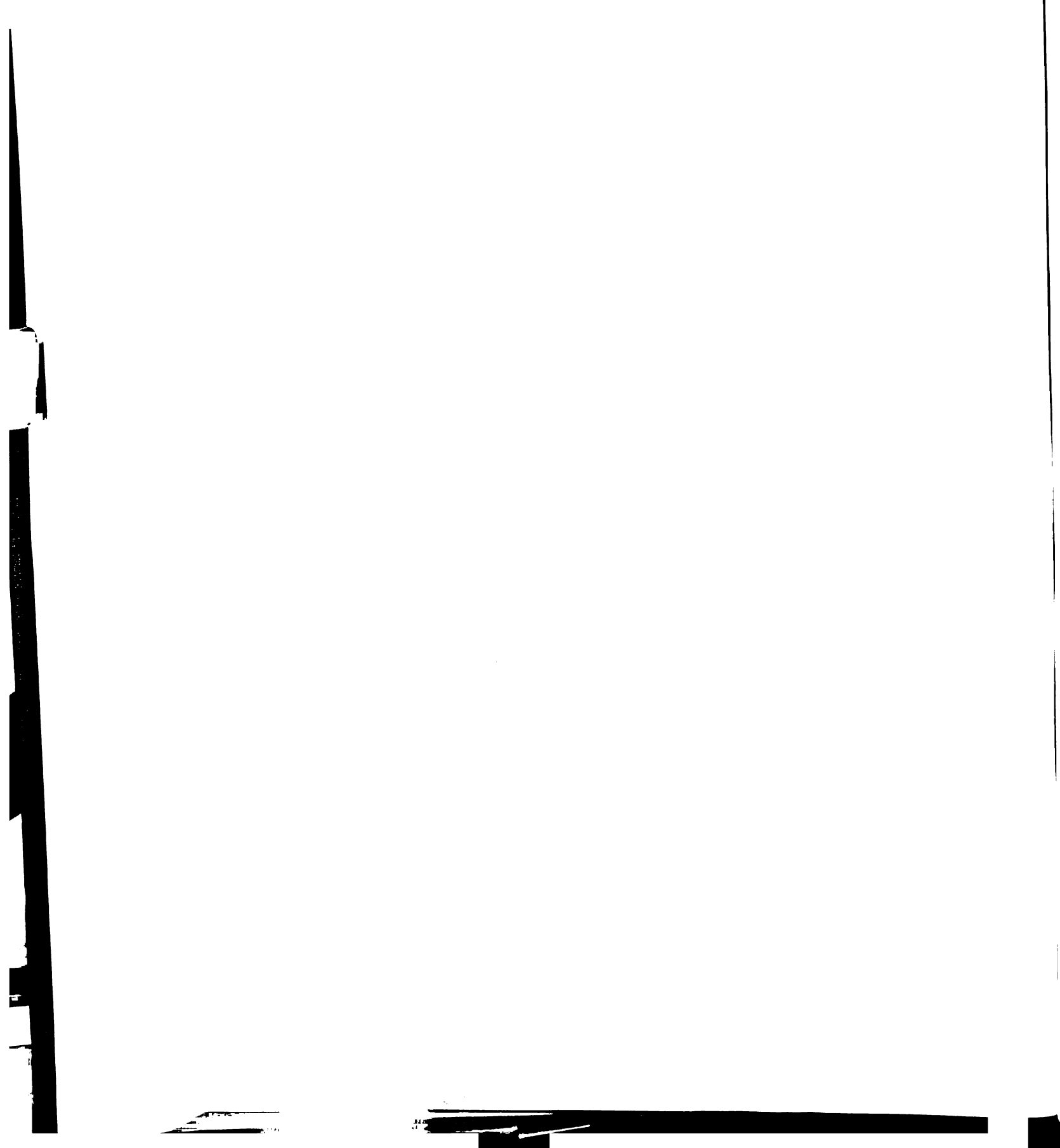
	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Increased forest management education programs	☐	☐	☐	☐	☐
Additional tax incentives for timber management on private lands	☐	☐	☐	☐	☐
Elimination of the estate tax	☐	☐	☐	☐	☐
Institute special capital gains tax rate for timber investments	☐	☐	☐	☐	☐
Uniform laws requiring best management practices	☐	☐	☐	☐	☐
Institute timber buyers certification	☐	☐	☐	☐	☐
Funding stewardship programs	☐	☐	☐	☐	☐

Q11. Do your customers want to know whether the veneer logs originate from sustainable forest management? Yes ☐ No ☐ Don't Know ☐

Q12. Do you produce or sell face veneer logs for international markets?
Yes ☐ No ☐ Don't Know ☐

If you answered *No* to Q12, do not answer questions 13 and 14. Instead proceed to question 15 and then return the survey in the self addressed stamped envelope provided. If you answered *Yes* to Q12, please check the category which best fits your export description and continue to the end of the survey. (*Checking all that apply*)

Sell to broker ☐
 Sell directly to international customers ☐
 Sell to domestic veneer plants which export ☐



Q13. What percentage of the veneer logs you produce or purchase are exported? (*Check one box only*)

Less than 1 Percent	☐	26 to 50%	☐
1 to 10%	☐	51 to 75%	☐
11 to 25%	☐	76 to 100%	☐

Q14. Please indicate to what extent agree or disagree with each of the following statements. (*Check one box for each statement*)

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

	SA	A	N	D	SD
The government policy of allowing unprocessed log exports is good for the economy.	☐	☐	☐	☐	☐
Foreign competition for high quality logs is unfair to American producers.	☐	☐	☐	☐	☐
World demand for eastern hardwoods is strong and will continue to grow.	☐	☐	☐	☐	☐
Changes in species demanded result primarily from changes in foreign demand.	☐	☐	☐	☐	☐

Q15. Use this space to tell us anything else you feel we should know about the veneer log resource.

1

1

Appendix C.6.

Reminder Postcard

April 16, 1998

A few weeks ago a questionnaire seeking your opinions of the veneer log resource was mailed to you. Your name was drawn at random from the primary producer guides and licensed timber buyers lists published in the Lake States, Illinois and Indiana.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, please complete and return it as soon as you can, since your opinion is vital to this project.

If for some reason you did not receive a copy of the survey, or got it misplaced, please contact Mike McGuire at (517) 432-5932, and another will be sent to you. Thank you!

Mike McGuire

Research Assistant

Appendix C.7.

Second Veneer Mill Cover Letter

June 12, 1998

Dear forestry professional,

I would like to invite you again to participate in a survey which I believe is very important to the fine hardwood veneer industry. From 1977 through 1997 I have worked in the hardwood industry and know many controversial issues face the veneer sector. I returned to the university hoping my work experience would be an advantage in examining some of these issues. I have the attention of federal, state, and university forestry professionals interested in the veneer log resource. It would be very helpful to me if I could have your opinion. The questions in this survey are directed at six fine hardwood species. These are red oak, white oak, ash, hard maple, black cherry, and black walnut. We are studying high grade veneer logs which are sliced for products such as panels, fine furniture, or architectural uses. Logs that are peeled for veneer are not the focus of this study. If you have already completed and returned the questionnaire to us, please accept my sincere thanks. If not, please complete this replacement questionnaire and return it in the envelope supplied.

You were chosen for this survey because your business is listed in the state primary producer guide as a veneer producer. Your participation in this survey is completely voluntary, but we urge you to participate to ensure that opinions of veneer producers are accurately represented. If you chose to participate, you may skip any questions you do not wish to answer and may stop the survey at any time. We expect this survey to take approximately 20 minutes of your time. The completed survey will be strictly confidential and your name will not be associated with any of your answers. Completing and returning this questionnaire will be taken as an indication of your voluntary agreement to participate.

If you have any questions about the project or the survey, please contact Mike McGuire at (517) 432-5932. Thank you very much for your help with these surveys!

Sincerely,

Mike McGuire
Graduate Research Assistant

Appendix C.8.

Second Loggers Cover Letter

May 27, 1998

Dear forestry professional,

I would like to invite you again to participate in a survey which I believe is very important to the forest products industry. From 1977 through 1997 I worked in the logging and sawmill occupation and know many controversial issues face our industry. I returned to the university hoping my work experience would be an advantage in examining some of these issues. I have the attention of federal, state, and university forestry professionals interested in the veneer log resource. It would be very helpful to me if I could have your opinion and it will be useful in determining the supply of veneer logs in the Lake States, Illinois and Indiana. This is your opportunity to ***get your two cents worth in***. If you have already completed and returned the questionnaire to us, please accept my sincere thanks. If not, please complete this replacement questionnaire and return it in the envelope supplied.

The questions in this survey are directed at six fine hardwood species. These are red oak, white oak, ash, hard maple, black cherry, and black walnut. We are studying high grade veneer logs which are sliced for products such as panels, fine furniture, or architectural uses. Logs that are peeled for veneer are not the focus of this study.

You were randomly chosen from primary producer guides and licensed timber buyer lists produced by the states studied in this project. Your participation in this survey is completely voluntary, but we urge you to participate to ensure that opinions of forestry professionals are accurately represented. If you chose to participate, you may skip any questions you do not wish to answer and may stop the survey at any time. We expect this survey to take approximately 20 minutes of your time. The completed survey will be strictly confidential and your name will not be associated with any of your answers. Completing and returning this questionnaire will be taken as an indication of your voluntary agreement to participate.

If you have any questions about the project or the survey, please contact Mike McGuire at (517) 432-5932. Thank you very much for your help with these surveys!

Sincerely,

Mike McGuire
Graduate Research Assistant

Appendix C.9.

Third Veneer Mill Personalized Cover Letter

June 12, 1998

Dear [insert name],

I am nearing completion of my survey regarding the veneer log resource in the Lake States, Illinois, and Indiana. I know you are very knowledgeable of this resource and it would be very helpful to me if I could have your opinion. If you chose to participate, you may skip any questions you do not wish to answer and may stop the survey at any time. I expect this survey to take approximately 20 minutes of your time. The completed survey will be strictly confidential and your name will not be associated with any of your answers.

The questions in this survey are directed at six fine hardwood species. These are red oak, white oak, ash, hard maple, black cherry, and black walnut. We are studying quality issues and have focused on high grade veneer logs which are sliced for products such as panels, fine furniture, or architectural uses. While logs that are peeled are not the focus of this study, even though your mill is a rotary facility your opinion of high quality veneer logs will be valuable to us. If you have already completed and returned the questionnaire to us, please accept my sincere thanks. If not, please complete this replacement questionnaire and return it in the envelope supplied.

You were chosen for this survey because your business is listed in the state primary producer guide as a veneer producer. Your participation in this survey is completely voluntary, but we urge you to participate to ensure that opinions of veneer producers are accurately represented. Completing and returning this questionnaire will be taken as an indication of your voluntary agreement to participate.

If you have any questions about the project or the survey, please contact Mike McGuire at (517) 432-5932. Thank you very much for your help with these surveys!

Sincerely,

Mike McGuire
Graduate Research Assistant

Appendix D

Tables Reporting Survey Results

Table 13. Respondent's years involved in the veneer log industry, veneer mill survey.

Years	Frequency	Percent
Less than one	1	3.8
1 to 5	1	3.8
6 to 10	3	11.5
11 to 20	3	11.5
21 to 30	9	34.6
Over 30	9	34.6
Total	26	100

Table 14. Respondent's years in veneer log procurement, sales, or consulting, logger's survey.

Years	Frequency	Percent
Non-response	7	1.8
Less than one	1	0.3
1 to 5	25	6.6
6 to 10	62	16.3
11 to 20	147	38.7
21 to 30	82	21.6
Over 30	56	14.7
Total	380	100

Table 15. Number and percent of respondent's answers to factors affecting domestic availability, veneer mill survey.

Independent Variable	Very Important		Somewhat Important		Neutral		Somewhat Unimportant		Very Unimportant		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Increased International Demand	16	64	7	28	2	8	0	0	0	0	1
Conflicting Landowner Objectives	2	8.3	17	70.8	5	20.8	0	0	0	0	1
Urban Development.	5	20	13	52	2	8	3	12	2	8	1
Increased Forest Land Fragmentation	5	20.8	10	41.7	6	25	2	8.3	1	4.2	2
Frequent Property Turnover	5	20	11	44	6	24	2	8	1	4	2
Increasing Absentee Ownership	2	8	12	48	7	28	2	8	2	8	1
Decreasing Parcel Size	6	24	12	48	4	16	2	8	1	4	1
Previous High-grading	11	44	11	44	3	12	0	0	0	0	1
Increased Environmental Regulations	12	48	9	36	3	12	1	4	0	0	1
Owner Mistrust of Loggers	4	16	14	56	4	16	3	12	0	0	1

Table 16. Number and percent of respondent's answers to factors affecting domestic availability, veneer mill survey.

Independent Variable	Very Important		Somewhat Important		Neutral		Somewhat Unimportant		Very Unimportant		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Increased International Demand	179	49.6	132	36.6	36	10	8	2.7	6	1.6	19
Conflicting Landowner Objectives	102	29.7	137	39.8	82	23.8	21	6.1	2	0.6	36
Urban Development	127	36.1	106	30.1	76	19	40	11.4	12	3.4	28
Increased Forest Land Fragmentation	114	32.9	129	37.3	70	20.2	25	7.2	8	2.3	34
Frequent Property Turnover	105	30.3	118	34	75	21.6	37	10.7	12	3.5	33
Increasing Absentee Ownership	40	11.6	103	29.9	128	37.1	61	17.7	13	3.8	35
Decreasing Parcel Size	98	27.8	139	39.5	64	18.2	44	12.5	7	2.0	28
Previous High-grading	161	44.8	131	36.5	45	12.5	18	5	4	1.1	21
Increased Environmental Regulations	123	34.5	111	31.1	63	17.6	33	9.2	27	7.6	23
Owner Mistrust of Loggers	147	40.7	115	31.9	60	16.6	34	9.4	5	1.4	19

Table 17. Means and standard deviations reported for factors affecting domestic availability, veneer mill survey.

Independent Variables	N	Minimum	Maximum	Mean	Std. Deviation
Increased international demand	25	1.00	5.00	1.440	.650
Conflicting landowner objectives	24	1.00	5.00	2.125	.536
Urban Development	25	1.00	5.00	2.360	1.186
Increased forest land fragmentation	24	1.00	5.00	2.333	1.049
Frequent property turnover	25	1.00	5.00	2.320	1.029
Increasing absentee ownership	25	1.00	5.00	2.600	1.040
Decreasing parcel size	25	1.00	5.00	2.200	1.040
Previous high grading	25	1.00	5.00	1.680	.690
Increased environmental regulations	25	1.00	5.00	1.720	.842
Owner mistrust of loggers	25	1.00	5.00	2.240	.879

Table 18. Means and standard deviations reported for factors affecting domestic availability, logger's survey.

Independent variables	N	Minimum	Maximum	Mean	Std. Deviation
Increased international demand	361	1.00	5.00	1.698	.863
Conflicting landowner objectives	344	1.00	5.00	2.081	.909
Urban Development	352	1.00	5.00	2.159	1.136
Increased forest land fragmentation	346	1.00	5.00	2.086	1.012
Frequent property turnover	347	1.00	5.00	2.230	1.098
Increasing absentee ownership	345	1.00	5.00	2.721	1.007
Decreasing parcel size	352	1.00	5.00	2.213	1.047
Previous high grading	359	1.00	5.00	1.810	.917
Increased environmental regulations	357	1.00	5.00	2.243	1.231
Owner mistrust of loggers	361	1.00	5.00	1.988	1.038

Table 19. Frequency and percent of answers to factors perceived to be contributing to scarcity of the veneer log resource, veneer mill survey.

Independent Variable	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Missing	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Veneer Located on Public Timberland	0	0	13	50	1	3.8	10	38.5	2	7.7	0	0
Time In Procurement is Increasing	12	46.2	12	46.2	1	3.8	1	3.8	0	0	0	0
Selection Harvests Promotes High-grading	1	4.0	13	52.0	3	12	6	24	2	8	1	1
Required NIPF Management Plans	1	3.8	4	15.4	6	23	9	36.4	6	23	0	0
Whole Tree Chipping	6	23.1	10	35.8	5	19.2	5	19.2	0	0	0	0
Standardized Tree Grades	3	11.5	11	42.3	3	11.5	4	15.4	5	19.2	0	0
Current Veneer Harvesting is Sustainable	1	3.8	7	26.9	8	30.8	7	26.9	3	11.5	0	0
Quality Veneer Logs are Obtainable for Higher Prices	4	15.4	10	38.5	7	26.9	5	19.2	0	0	0	0

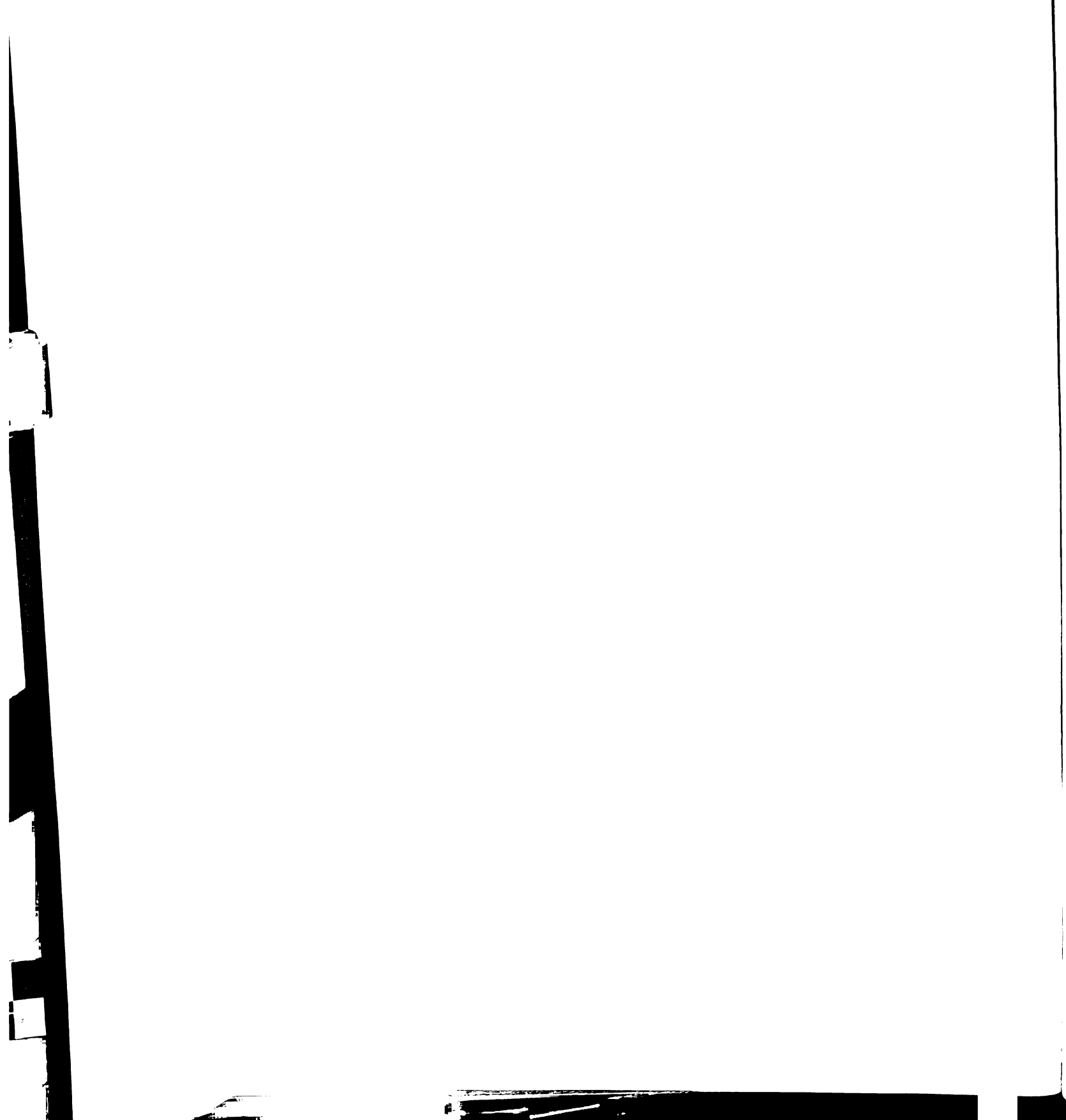


Table 20. Frequency and percent of answers to factors perceived to be contributing to scarcity of the veneer log resource, logger's survey.

Independent Variable	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Veneer Located on Public Timberland	75	20.2	116	31.3	74	19.9	88	23.7	18	4.9	9
Time In Procurement is Increasing	107	28.9	186	50.3	61	16.9	14	3.8	2	0.5	10
Selection Harvests Promotes High-grading	76	20.7	159	43.2	61	16.6	61	16.6	23	6.6	12
Required NIPF Management Plans	44	12	68	18.5	59	16.1	69	18.8	127	34.6	13
Whole Tree Chipping	128	34.9	106	28.9	53	14.4	51	13.9	29	7.9	13
Standardized Tree Grades	76	20.6	110	29.8	95	25.7	62	16.8	26	7	11
Current Veneer Harvesting is Sustainable	22	6.0	42	38.7	85	23.2	92	25.1	26	7.1	13
Quality Veneer Logs are Obtainable for Higher Prices	51	13.7	160	42.9	57	15.3	93	24.9	12	3.2	7

Table 21. Means and standard deviations for factors perceived to be contributing to scarcity, veneer mill survey.

Independent variables	N	Minimum	Maximum	Mean	Std. Deviation
Veneer Located on Public Timberland	26	1.00	5.00	3.039	1.112
Time In Procurement is Increasing	26	1.00	5.00	1.652	.745
Selection Harvests Promotes High-grading	25	1.00	5.00	2.800	1.118
Required NIPF Management Plans	26	1.00	5.00	3.577	1.137
Whole Tree Chipping	26	1.00	5.00	2.346	1.056
Standardized Tree Grades	26	1.00	5.00	2.885	1.366
Current Veneer Harvesting is Sustainable	26	1.00	5.00	3.154	1.084
Quality Veneer Logs are Obtainable for Higher Prices	26	1.00	5.00	2.500	.989

Table 22. Means and standard deviations for factors perceived to be contributing to scarcity, logger's survey.

Independent variables	N	Minimum	Maximum	Mean	Std. Deviation
Veneer Located on Public Timberland	371	1.00	5.00	2.617	1.187
Time In Procurement is Increasing	370	1.00	5.00	1.967	.809
Selection Harvests Promotes High-grading	368	1.00	5.00	2.413	1.140
Required NIPF Management Plans	367	1.00	5.00	3.455	1.426
Required NIPF Management Plans	367	1.00	5.00	3.455	1.426
Whole Tree Chipping	367	1.00	5.00	2.310	1.291
Whole Tree Chipping	367	1.00	5.00	2.310	1.291
Standardized Tree Grades	369	1.00	5.00	2.598	1.189
Standardized Tree Grades	369	1.00	5.00	2.598	1.189
Current Veneer Harvesting is Sustainable	367	1.00	5.00	2.885	1.072
Current Veneer Harvesting is Sustainable	367	1.00	5.00	2.885	1.072
Quality Veneer Logs are Obtainable for Higher Prices	373	1.00	5.00	2.611	1.098

es

Table 23. Frequency and percent of responses to market characteristics perceived to be contributing to scarcity, veneer mill survey.

Independent Variable	Very Important		Somewhat Important		Neutral		Somewhat Unimportant		Very Unimportant		Missing	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Establishing Uniform Log Grades	3	12	7	28	3	12	9	36	3	12	1	
Standardizing Veneer Product Grades	2	8	10	40	3	12	7	28	3	12	1	
Promotion of Character Marked Wood	5	20	14	56	4	16	1	4	1	4	1	
Competition From Substitute Products	8	33.3	13	54.2	2	8.3	1	4.2	0	0	2	
Marketing Efforts Aimed at Odd Species	1	4	14	56	7	28	1	4	2	8	1	
Log Color	10	40	10	40	4	16	1	4	0	0	1	

Table 24. Frequency and percent of responses to market characteristics perceived to be contributing to scarcity, logger's survey.

Independent Variable	Very Important		Somewhat Important		Neutral		Somewhat Unimportant		Very Unimportant		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Establishing Uniform Log Grades	142	38.9	90	24.7	70	19.2	41	11.2	22	6	15
Standardizing Veneer Product Grades	111	30.7	105	29	91	25.1	36	9.9	19	5.2	15
Banning Hardwood Log Exports	86	23.8	45	12.5	112	31	49	13.6	69	19.1	15
Promotion of Character Marked Wood	76	21.1	136	37.7	109	30.2	25	6.9	15	4.2	19
Competition From Substitute Products	98	27.1	141	39	72	19.9	33	9.1	18	5	18
Marketing Efforts Aimed at Odd Species	84	23.3	146	40.4	90	24.9	29	8	12	3.3	19
Log Color	145	39.9	140	38.6	55	15.2	17	4.7	6	1.7	17

Table 26. Means and standard deviations for market characteristics perceived to be contributing to scarcity, logger's survey.

Independent variables	N	Minimum	Maximum	Mean	Std. Deviation
Establishing uniform veneer log grades	365	1.00	5.00	2.208	1.238
Standardizing veneer product grades	362	1.00	5.00	2.301	1.158
Ban hardwood log exports	361	1.00	5.00	2.916	1.405
Promotion of character marked wood	361	1.00	5.00	2.354	1.020
Competition from substitute products	362	1.00	5.00	2.259	1.103
Marketing efforts aimed at odd species	361	1.00	5.00	2.277	1.014
Log color	363	1.00	5.00	1.895	.937

Table 27. Frequency and percent of respondent's perception of quality by species group, veneer mill survey.

Species Group	Increasing		About the Same		Decreasing		Don't Know		Missing
	No.	%	No.	%	No.	%	No.	%	
Red Oak	1	4.0	6	24.0	17	68.0	1	4.0	1
White Oak	1	4.2	3	12.5	15	62.5	5	20.8	2
Ash	0	0.0	10	41.7	9	37.5	5	20.8	2
Hard Maple	2	8.0	3	12.0	17	68.0	3	12.0	1
Black Cherry	0	0.0	8	33.0	11	45.0	5	20.0	2
Black Walnut	0	0.0	3	12.5	12	50.0	9	37.0	2

Table 28. Frequency and percent of respondent's perception of quality by species group, logger's survey.

Species Group	Increasing		About the Same		Decreasing		Don't Know		Missing
	No.	%	No.	%	No.	%	No.	%	
Red Oak	24	6.6	148	40.5	173	47.4	20	5.4	15
White Oak	13	3.6	87	24.3	207	57.8	51	14.2	22
Ash	31	8.6	156	43.5	139	37.8	33	9.2	21
Hard Maple	61	16.5	131	35.5	154	41.7	23	6.2	11
Black Cherry	30	8.3	114	31.6	170	47.1	47	13	19
Black Walnut	19	5.4	80	22.6	176	49.7	79	22.3	26

Table 29. Means and standard deviations for perception of quality by species group, veneer mill survey.

Species Groups	N	Minimum	Maximum	Mean	Std. Deviation
Red Oak	25	1.00	4.00	2.720	.613
White Oak	24	1.00	4.00	3.000	.722
Ash	24	1.00	4.00	2.791	.779
Hard Maple	25	1.00	4.00	2.840	.746
Black Cherry	24	1.00	4.00	2.875	.740
Black Walnut	24	1.00	4.00	3.250	.675

Table 30. Means and standard deviations for perception of quality by species group, logger's survey.

Species Groups	N	Minimum	Maximum	Mean	Std. Deviation
Red Oak	365	1.00	4.00	2.517	.701
White Oak	358	1.00	4.00	2.826	.708
Ash	359	1.00	4.00	2.484	.779
Hard Maple	369	1.00	4.00	2.376	.831
Black Cherry	361	1.00	4.00	2.648	.810
Black Walnut	354	1.00	4.00	2.889	.808

Table 31. Means and standard deviations for perception of quantity by diameter class, veneer mill survey.

Diameter Class	N	Minimum	Maximum	Mean	Std. Deviation
Small (11-15)	26	1.00	4.00	1.692	.837
Medium (16-20)	26	1.00	4.00	2.653	.561
Large (21+)	25	1.00	4.00	3.000	.288

Table 32. Means and standard deviations for perception of quantity by diameter class, logger's survey.

Diameter Class	N	Minimum	Maximum	Mean	Std. Deviation
Small (11-15)	369	1.00	4.00	1.699	.862
Small (11-15)	369	1.00	4.00	1.699	.862
Medium (16-20)	373	1.00	4.00	2.340	.651
Medium (16-20)	373	1.00	4.00	2.340	.651
Large (21+)	366	1.00	4.00	2.877	.472
Large (21+)	366	1.00	4.00	2.877	.472

Table 33. Frequency and percent of respondent's beliefs about real prices over ten years, by species group for veneer mill survey.

Species Group	Increasing		Remain the Same		Decrease		Non response
	No.	%	No.	%	No.	%	
Select Red Oak	20	87.0	3	13.0	0	0	3
Select White Oak	18	90.0	2	10.0	0	0	6
Ash	14	73.7	15	26.3	0	0	7
Hard Maple	22	95.7	1	4.3	0	0	3
Black Cherry	19	90.5	1	4.8	1	4.8	5
Black Walnut	13	65.0	7	35.0	0	0	6

Table 34. Frequency and percent of respondent's beliefs about real prices over ten years, by species group for logger's survey.

Species Group	Increasing		Remain the Same		Decrease		Non response
	No.	%	No.	%	No.	%	
Select Red Oak	238	69.4	94	27.4	11	3.2	37
Select White Oak	221	67.8	91	27.9	14	4.3	54
Ash	171	51.4	133	39.9	29	8.7	47
Hard Maple	243	69.8	75	21.6	30	8.6	32
Black Cherry	239	72.2	72	21.8	20	6.0	49
Black Walnut	212	67.5	83	26.4	19	6.1	66

Table 35. Mean, standard deviation, minimum, and maximum values of respondent's beliefs about real prices over ten years, by species group, veneer mill survey.

Species Groups	N	Minimum	Maximum	Mean	Std. Deviation
Red Oak	23	1.00	3.00	1.130	.344
White Oak	20	1.00	3.00	1.100	.307
Ash	19	1.00	3.00	1.263	.452
Hard Maple	23	1.00	3.00	1.043	.208
Black Cherry	21	1.00	3.00	1.142	.478
Black Walnut	20	1.00	3.00	1.350	.489

Table 36. Mean, standard deviation, minimum, and maximum values of respondent's beliefs about real prices over ten years, by species group, logger's survey.

Species Groups	N	Minimum	Maximum	Mean	Std. Deviation
Red Oak	343	1.00	3.00	1.338	.537
White Oak	326	1.00	3.00	1.365	.564
Ash	333	1.00	3.00	1.573	.648
Hard Maple	348	1.00	3.00	1.387	.641
Black Cherry	331	1.00	3.00	1.338	.588
Black Walnut	314	1.00	3.00	1.385	.599

Table 37. Minimum, maximum, and mean predicted future price increases with standard deviation, veneer mill survey.

Species Groups	N	Minimum (dollars)	Maximum (dollars)	Mean	Std. Deviation
Red Oak	13	10.00	40.00	18.0769	8.5485
White Oak	9	10.00	40.00	18.6667	11.6082
Ash	6	10.00	30.00	17.5000	8.8034
Hard Maple	11	10.00	70.00	25.7273	16.3039
Black Cherry	8	10.00	60.00	22.5000	16.4751
Black Walnut	5	10.00	50.00	21.0000	17.4642

Table 38. Minimum, maximum, and mean predicted future price increases with standard deviation, logger survey.

Species Groups	N	Minimum (dollars)	Maximum (dollars)	Mean	Std. Deviation
Red Oak	124	5.00	300.00	33.70	37.95
White Oak	111	3.00	300.00	36.45	39.17
Ash	95	1.00	300.00	33.25	38.00
Hard Maple	124	2.00	300.00	35.17	38.00
Black Cherry	116	10.00	300.00	37.33	38.24
Black Walnut	103	2.00	300.00	37.24	41.07

Table 39. Frequencies and percentages of factors influencing future availability, veneer mill survey.

Independent Variable	Very Important		Somewhat Important		Neutral		Somewhat Unimportant		Very Unimportant		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Increased Forest Management Education	13	50	11	43.3	1	3.8	1	3.8	0	0	0
Tax Incentives for NIPF Lands	8	30.8	15	57.7	3	11.5	0	0	0	0	0
Elimination of the Estate Tax	6	23.1	9	34.6	11	42.3	0	0	0	0	0
Special Capital Gains Tax	10	38.5	11	42.3	5	19.2	0	0	0	0	0
Rate for Timber Investments	7	28	8	32	7	28	1	4	2	8	1
Banning Hardwood Log Exports	13	50	0	0	10	30.8	2	7.7	1	3.8	0
Uniform Laws requiring BMP's	2	7.7	4	15.4	14	53.8	3	11.5	3	11.5	0
Institute Timber Buyer's Certification	1	3.8	11	42.3	12	42.6	1	3.8	1	3.8	0
Funding Stewardship Programs											

Table 40. Frequencies and percentages of factors influencing future availability, logger survey.

Independent Variable	Very Important		Somewhat Important		Neutral		Somewhat Unimportant		Very Unimportant		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Increased Forest Management Education	201	54.2	100	27.2	34	9.2	21	5.7	12	3.3	12
Tax Incentives for NIPF Lands	183	49.7	104	28.7	42	11.4	18	4.9	21	5.7	12
Elimination of the Estate Tax	164	44.6	96	26.1	84	22.8	16	4.3	8	2.2	12
Special Capital Gains Tax	181	50.1	101	28	52	14.4	13	3.6	14	3.9	19
Rate for Timber Investments	73	20.2	99	27.3	91	25.1	39	10.8	60	16.6	18
Uniform Laws requiring Best Management Practices	94	25.8	80	22	83	22.8	46	12.6	61	16.8	16
Institute Timber Buyer's Certification	89	24.5	108	29.8	104	28.7	23	6.3	39	10.7	17
Funding Stewardship Programs											

Table 41. Means and standard deviations for factors affecting future availability, veneer mill survey.

Independent variables	N	Minimum	Maximum	Mean	Std. Deviation
Increased Forest Management Education Programs	26	1.00	5.00	1.615	.752
Tax Incentives for NIPF lands	26	1.00	5.00	1.807	.633
Elimination of the Estate Tax	26	1.00	5.00	2.192	.801
Special Capital Gains Tax Rate for Timber Investment	26	1.00	5.00	1.807	.749
Banning Hardwood Log Exports	25	1.00	5.00	2.320	1.180
Uniform Laws Requiring Best Management Practices	26	1.00	5.00	2.653	.797
Institute Timber Buyers Certification	26	1.00	5.00	3.038	1.038
Funding Stewardship Programs	26	1.00	5.00	2.615	.803

Table 42. Means and standard deviations for factors affecting future availability, veneer mill survey.

Independent variables	N	Minimum	Maximum	Mean	Std. Deviation
Increased Forest Management Education Programs	368	1.00	5.00	1.758	1.051
Tax Incentives for NIPF lands	368	1.00	5.00	1.885	1.1451
Elimination of the Estate Tax	368	1.00	5.00	1.934	1.020
Special Capital Gains Tax Rate for Timber Investment	361	1.00	5.00	1.831	1.055
Uniform Laws Requiring Best Management Practices	362	1.00	5.00	2.762	1.341
Institute Timber Buyers Certification	364	1.00	5.00	2.725	1.406
Funding Stewardship Programs	363	1.00	5.00	2.490	1.231

Table 43. Percentage of veneer logs respondents export, veneer mill survey.

Percentage of logs exported	Number of respondents	Responses (in percent)
Less than 1 percent	6	23.1
1 to 10%	7	26.9
11 to 25%	1	3.8
26 to 50%	1	3.8
Non response	11	42.3

Table 44. Percentage of veneer logs respondents export, logger survey.

Percentage of logs exported	Number of respondents	Responses (in percent)
Less than 1 percent	29	7.6
1 to 10%	100	26.3
11 to 25%	41	10.8
26 to 50%	55	14.5
51 to 75%	19	5.0
Over 75%	13	3.4
Non response	123	32.4

Table 45. Frequency and percent of responses to export statements, veneer mill survey.

Independent Variable	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Government Log Export Policy	1	5.9	4	23.5	5	29.4	1	5.9	6	35.3	9
Foreign Competition	2	11.8	5	29.4	5	29.4	4	25.3	1	5.9	9
World Demand	6	35.3	7	42.1	3	17.6	0	0	1	5.9	9
Changes in Species Demanded	2	11.8	4	25.3	6	35.3	3	17.6	2	11.8	9

Table 46. Frequency and percent of responses to export statements, logger survey.

Independent Variable	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Missing
	No.	%	No.	%	No.	%	No.	%	No.	%	
Government Log Export Policy	63	21.8	118	40.8	56	19.4	24	8.3	28	9.7	91
Foreign Competition	24	8.3	34	11.7	67	23.1	10	35.2	63	21.7	90
World Demand	85	29.6	142	49.5	42	14.6	14	4.9	4	1.4	93
Changes in Species Demanded	49	17	124	43.1	65	22.6	42	14.6	8	2.8	92

Table 47. Mean, standard deviation, minimum and maximum for export statements, veneer mill survey.

Export Statements	N	Minimum	Maximum	Mean	Std. Deviation
Government Log Export Policy	17	1.00	5.00	3.411	1.372
Foreign Competition	17	1.00	5.00	2.823	1.131
World Demand	17	1.00	5.00	1.941	.899
Changes in Foreign Demand	17	1.00	5.00	2.941	1.197

Table 48. Mean, standard deviation, minimum and maximum for export statements, logger survey.

Export Statements	N	Minimum	Maximum	Mean	Std. Deviation
Government Log Export Policy	289	1.00	5.00	2.432	1.197
Foreign Competition	290	1.00	5.00	3.503	1.191
World Demand	288	1.00	5.00	1.989	.875
Changes in Foreign Demand	288	1.00	5.00	2.430	1.023

Table 49. Frequencies and percents regarding industry trends, veneer mill survey.

Species Group	Increasing		About the Same		Decreasing		Don't Know		Missing
	No.	%	No.	%	No.	%	No.	%	
Volume of Veneer Logs Used	17	68	7	28	1	4	0	0	1
Veneer Industry Profit Margins	1	4.2	5	20.8	18	75	0	0	2
Economic Specialization	11	44	14	56	0	0	0	0	1
% of Veneer Log Price Increases Going to Landowners	13	52	11	44	0	0	1	4	1
Marketing Efforts directed at Niche Markets	7	28	15	60	0	0	2	8	1
Customer Acceptance of Veneer With More Visible Defects	8	32	12	48	4	16	1	4	1
% of Logs Yielding Architectural Veneer	2	8.3	5	20.8	15	62.5	2	8.3	2
% of Logs Yielding Panel Veneer	2	8	8	32	14	56	1	4	1
% of Logs Yielding Furniture Veneer	16	64	6	24	2	8	1	4	1

Table 50. Mean, standard deviation, minimum and maximum values for industry trends, veneer mill survey.

Industry Trends	N	Minimum	Maximum	Mean	Std. Deviation
Volume of Veneer Logs Used	25	1.00	4.00	1.360	.568
Veneer Industry Profit Margins	24	1.00	4.00	2.708	.550
Specialization Within the Veneer Industry	25	1.00	4.00	1.560	.506
% of Price Increases going to Landowners	25	1.00	4.00	1.560	.711
Marketing Efforts Directed at Niche Markets	25	1.00	4.00	1.920	.812
% of Logs Yielding Architectural Grade Veneer	24	1.00	4.00	2.708	.750
% of Logs Yielding Panel Grade Veneer	25	1.00	4.00	2.560	.711
% of Logs Yielding Furniture Grade Veneer	25	1.00	4.00	1.520	.822
Customer Acceptance of Veneer with more Visible Defects	25	1.00	4.00	1.920	.812

Appendix E

Tables Reporting ANOVA Results

Table 51. ANOVA test results of **logger** attitudes regarding domestic availability, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Increased international demand	208	1.74	.9155	.227
Conflicting landowner objectives	196	2.08	.9101	.900
Urban Development	205	2.14	1.1118	.661
Increased forest land fragmentation	198	2.11	1.0095	.681
Frequent property turnover	205	2.22	1.0917	.822
Increasing absentee ownership	202	2.70	.9879	.682
Decreasing parcel size	206	2.18	1.0692	.477
Previous high grading	209	1.84	.8874	.443
Increased environmental regulations	206	2.25	1.2627	.876
Owner mistrust of loggers	210	1.89	1.0083	.033*

* Statistically significant.

Table 52. ANOVA test results of **non-logger** attitudes regarding domestic availability, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Increased international demand	150	1.63	.7808	.230
Conflicting landowner objectives	145	2.04	.8809	.487
Urban Development	144	2.17	1.1587	.917
Increased forest land fragmentation	145	2.04	.9922	.480
Frequent property turnover	141	2.21	1.0942	.803
Increasing absentee ownership	140	2.70	1.0143	.824
Decreasing parcel size	143	2.24	1.0085	.639
Previous high grading	147	1.77	.9656	.472
Increased environmental regulations	148	2.21	1.983	.723
Owner mistrust of loggers	148	2.10	1.0699	.069

* Statistically significant.

Table 53. ANOVA test results of **logger** attitudes regarding future availability, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Increased Forest Management Education Programs	214	1.82	1.0687	.167
Additional Tax Incentives for NIPF Lands	215	2.00	1.2342	.023*
Elimination of the Estate Tax	214	2.02	1.0678	.050*
Special Capital Gains Tax Rate for Timber Investment	210	1.94	1.1412	.023*
Uniform Laws Requiring Best Management Practices	212	2.74	1.3747	.713
Institute Timber Buyers Certification	211	2.64	1.3634	.199
Funding Stewardship Programs	212	2.46	1.2365	.548

* Statistically significant.

Table 54. ANOVA test results of **non-logger** attitudes regarding future availability, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Increased Forest Management Education Programs	152	1.66	1.0171	.125
Additional Tax Incentives for NIPF Lands	151	1.71	.9891	.017*
Elimination of the Estate Tax	152	1.78	.9149	.012*
Special Capital Gains Tax Rate for Timber Investment	149	1.69	.9072	.035*
Uniform Laws Requiring Best Management Practices	148	2.79	1.2897	.741
Institute Timber Buyers Certification	151	2.83	1.4503	.242
Funding Stewardship Programs	149	2.55	1.2271	.439

* Statistically significant.

Table 55. ANOVA test results of **logger** attitudes regarding availability, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Veneer Located on Public Timberland	217	2.50	1.2023	.027*
Time in Procurement is Increasing	218	2.01	.7944	.189
Selection Harvests Promotes High- grading	216	2.38	1.1229	.564
Required NIPF Management Plans	215	3.41	1.4175	.466
Whole Tree Chipping	216	2.30	1.2785	.864
Standardized Tree Grades	218	2.49	1.1369	.029*
Current Veneer Harvesting is Sustainable	216	2.83	1.0826	.265
Quality Veneer Logs are Obtainable for Higher Prices	220	2.67	1.0651	.195

* Statistically significant.

Table 56. ANOVA test results of **non-logger** attitudes regarding availability, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Veneer Located on Public Timberland	155	2.78	1.1525	.025*
Time in Procurement is Increasing	153	1.90	.8173	.191
Selection Harvests Promotes High- grading	153	2.46	1.1697	.529
Required NIPF Management Plans	153	3.52	1.4378	.487
Whole Tree Chipping	152	2.30	1.3174	.921
Standardized Tree Grades	152	2.76	1.2448	.033*
Current Veneer Harvesting is Sustainable	152	2.97	1.0607	.186
Quality Veneer Logs are Obtainable for Higher Prices	154	2.51	1.1447	.148

* Statistically significant.

Table 57. ANOVA test results of **logger** attitudes regarding log exports, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Government Log Export Policy	162	2.48	1.1754	.433
Foreign Competition	163	3.40	1.1687	.111
World Demand	162	2.04	.9147	.238
Changes is Species Demand	161	2.39	.9366	.465

* Statistically significant.

Table 58. ANOVA test results of **non-logger** attitudes regarding log exports, logger's survey.

Dependent variables	N	Mean	Std. Deviation	Sig.
Government Log Export Policy	125	2.37	1.2084	.425
Foreign Competition	126	3.64	1.1964	.081
World Demand	124	1.92	.8224	.237
Changes in Species Demand	125	2.51	1.1189	.238

* Statistically significant.

Table 59. ANOVA values for **logger's** attitudes regarding **quality**, logger's survey.

Species Group	N	Mean	Std. Deviation	Sig.
Red Oak	215	2.48	.7223	.207
White Oak	210	2.81	.7134	.583
Ash	213	2.44	.7540	.204
Hard Maple	220	2.26	.8282	.001*
Black Cherry	215	2.60	.8134	.171
Black Walnut	208	2.92	.7974	.430

* Statistically significant.

Table 60. ANOVA values for **non-logger** attitudes regarding quality, logger's survey.

Species Group	N	Mean	Std. Deviation	Sig.
Red Oak	151	2.57	.6684	.237
White Oak	149	2.84	.6981	.785
Ash	147	2.53	.7964	.353
Hard Maple	150	2.53	.7915	.003*
Black Cherry	147	2.70	.7887	.308
Black Walnut	147	2.84	.8196	.298

* Statistically significant.

Table 61. ANOVA values for logger and non-logger attitudes regarding quantity, logger's survey.

Size Class (inches)	N	Mean	Std. Deviation	Sig.	Respondents
Small (11-15)	217	1.63	.8065	.071	Logger's
Medium (16-20)	220	2.24	.6560	.000*	Logger's
Large (21+)	217	2.84	.5122	.099	Logger's
Small (11-15)	153	1.79	.9344	.066	Non-logger's
Medium (16-20)	154	4.49	.6182	.000*	Non-logger's
Large (21+)	150	2.93	.4030	.094	Non-logger's

* Statistically significant.

Table 62. ANOVA values for **logger** attitudes regarding real price over the next ten years, logger's survey.

Species Group	N	Mean	Std. Deviation	Sig.
Red Oak	199	1.35	.5476	.583
White Oak	187	1.37	.5670	.731
Ash	195	1.59	.6626	.589
Hard Maple	204	1.39	.6457	.884
Black Cherry	197	1.34	.5913	.799
Black Walnut	183	1.39	.6187	.778

* Statistically significant.

Table 63. ANOVA values for **non-logger** attitudes regarding real price over the next ten years, logger's survey.

Species Group	N	Mean	Std. Deviation	Sig.
Red Oak	144	1.32	.5243	.583
White Oak	139	1.35	.5629	.731
Ash	138	1.54	.6292	.477
Hard Maple	144	1.38	.6368	.884
Black Cherry	135	1.31	.5815	.611
Black Walnut	131	1.37	.5712	.636

* Statistically significant.

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