CONSUMER RING COUNT AND GRAIN TEXTURE PREFERENCES OF SELECTED EASTERN UNITED STATES HARDWOODS

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Abstract.—Historically, eastern hardwoods have been a staple of forest products production. However, hardwood producers are now faced with serious challenges from substitutable products, such as imports of foreign species, utilization of foreign species in overseas manufacture (e.g., case goods, etc.), and composite-based materials that are imported or manufactured here in the United States. In today's globally competitive marketplace, product distinction is a key to success. Without a functioning manufacturing base, forest management and subsequently forest health, sustainable forestry, and markets for U.S. timberland owners are potentially diminished. Consumer data for ring-density count and grain texture preferences were collected via field studies at several sites in the U.S. The results are directly applicable to forest management of the eastern hardwood resource and afford forest managers the opportunity to manage hardwood forests with the ultimate consumer in mind. Findings from the ring density and texture attributes (i.e., grain) are directly applicable to forest management schemas for the eastern hardwood resource. For example, should a forest manager apply timber stand improvement or single tree selection to attenuate or amplify wood characteristics and/or attributes?

INTRODUCTION

Hardwood lumber in the eastern U.S. is unique because of the large number of marketable species and price variability across species (Luppold and Prestemon 2003). Hardwood has been a staple of forest products production with products ranging from barrel staves to cabinetry to flooring to moulding. Each hardwood species has a unique array of physical attributes, including ring count (e.g., fine, medium, and loose), grain texture (e.g., fast-slow, slow-fast growth patterns [variable vs. consistent]), color, and machinability. Hardwood value is primarily derived from those physical attributes that collectively comprise the appearance attributes color, grain, and texture. However, hardwood producers and manufacturers now confront unprecedented challenges from substitutable products, notably imports of foreign species, both hardwood and softwood; nontimber species (e.g., bamboo); U.S. softwoods; and composite-based materials. For instance, Burgess (1998) reports that the simulation of both wood grain and color in plastic products is being utilized successfully in the production of siding, and outdoor furniture, and for other applications. Burgess(1998) also notes that products are being developed for new markets.

In today's globally competitive marketplace, product distinction is a key to success. However, prices can change due to exogenous factors such as fashion, demand, and substitutability. For example, Luppold and others (2001) reported that in January 1968 grade No. 1 Common 4/4 Appalachian yellow-poplar's price was 33 percent greater than that of No. 1 Common 4/4 red oak; but by January 1993 No. 1 Common red oak was 136 percent greater than yellow-poplar. The reversal in relative prices of these two species is primarily attributed to pricing and supply pressures resulting from fashion and style changes.

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Historically, U.S. furniture was manufactured primarily with U.S. hardwoods. Approximately 1.5 billion board feet of lumber was used in furniture manufacture in 2003, about 15 percent of the hardwood lumber production for that year (Luppold 2004). China imported more than 25 million m^3 of logs in 2002, a 50 percent increase in volume and a 20 percent increase in value as compared to 2001. Sawn wood imports (5.5 million m^3 - 75 percent of which is hardwood) increased 35 percent in volume and 23 percent in value during the same period (International Wood Markets Research 2004). China's primary timber trading partner is Russia, and major border towns in China have increased their populations by an average of 300 percent in reaction to the opportunities in timber trade. Trade in hardwood logs and sawn lumber between the two countries also has escalated greatly since 1997 as a result of the devaluation of the ruble and China's new government-imposed restrictions on the annual timber harvest. Imports have grown from roughly 1 million m^3 per year in 1997 to 10 million m^3 in 2002 and now represent approximately 65 percent of China's log and lumber imports. Log and lumber imports from the Russian Far East are expected to grow further, by at least 10 to 15 percent per year (Wood Markets Monthly 2003).

With unprecedented competitive threats, improving the market environment for eastern U.S. hardwoods is of paramount importance. The viability of diverse manufacturing sectors is at stake, as are healthy forests. If we lack a functioning manufacturing base, forest management efforts will decrease. Forest health will suffer as sustainable forestry initiatives decline. Subsequently, markets for U.S. timberland owners may shrink. Moreover, we also must consider both direct and indirect effects occurring throughout the value chain of wood products manufacturing: timberland owners, loggers, primary manufacturing (e.g., sawmills), secondary manufacturing (e.g., wood components), and service industries (e.g., banking, machinery, mechanical, suppliers).

CONSUMER PREFERENCE

Consumer preference for discrete hardwoods is based on the assumption of a real or imagined "choice" between U.S. hardwoods and alternatives. Consumers may rank alternatives on the basis of one or more dimensions: satisfaction, gratification, enjoyment, or utility the choice provides. How will consumers judge (i.e., evaluate) and express preferences for products manufactured from discrete hardwood species and man-made materials?

Findings from the ring density and texture attributes (i.e., grain) are directly applicable to forest management schemas for the eastern hardwood resource. For example, should a forest manager apply timber stand improvement or single tree selection to attenuate or amplify wood characteristics/attributes?

OBJECTIVES

We had three objectives in our study of consumer preferences for hardwoods and hardwood attributes:

1. To discern if U.S. consumers have a preference for selected eastern hardwood species vs. comparable foreign species and identify attributes, opportunities, and weaknesses of eastern U.S. hardwoods
2. To investigate preferences for ring count and grain texture
3. To determine how differences in select eastern hardwood attributes, if present, might affect the potential use of hardwood in various hardwood sectors.

Table 1.—Natural species contrasts

Species	Norway maple	Rubberwood	Russian birch	Lyptus
Black cherry				x
Sugar maple	x	x		
White oak		x	x	

Table 2.—Species, grain, and grain patterns

Species	Fine Grain,[1,a]	Medium[1,a]	Loose[1,a]	Textured[2]	Finger jointed
Black cherry	x	x	x	x	x
Sugar maple	x	x	x	x	x
White oak	x	x	x	x	x
Rubberwood	x	x	x	x	x
Norway maple	x	x	x	x	x
Russian birch	x	x	x	x	x
Lyptus®	x	x	x	x	x
Cherry laminate[3]		x[3]			
White oak laminate[3]		x			
Hard maple laminate[3]		x			

[1] grain is consistent[a] (e.g., uniform or nearly uniform growth increments).
[2] varied texture.
[3] only 3-laminate tables will be produced, each in the manufacturers' finish.
[a] Fine (≥ 9 rings per inch); Medium (5 to 8 rings per inch); Loose (≤ 4 rings per inch).

MATERIALS AND METHODS

Materials

Thirty-eight hardwood end-tables (approximately 15 in. x 20 in. x 28 in. tall) were manufactured. American species utilized were: black cherry (*P. serotina*), sugar maple (*A. saccharum*), white oak (*Q. alba*); foreign species were Norway maple (*A. platanoides*), rubberwood (*H. brasiliensis*), Russian birch (*B. pendula*), and Lyptus®, sold as a Brazilian cherry (*E. grandis* var. urophylla). End-tables also were manufactured using commercially available man-made laminates that substitute for cherry, oak, and maple. As definitive data regarding actual hardwood consumption are lacking, these species were selected because they represent a spectrum ranging from ring diffuse to ring porous, and for the most part, represent lighter-colored woods.

Further, for each species group, end-tables were produced with the following ring attributes (i.e., rings per inch)—fine (≥ nine rings/in.), medium (five to eight rings/in.), and loose (≤ four rings/in.)—and with varied texture attributes, either fast-to-slow or slow-to-fast (variable growth pattern vs. consistent growth pattern). The natural species material contrast is presented in Table 1 and species and grain patterns are presented in Table 2.

Methods

Utilization attribute information was collected by field studies with the focus on acquiring an in-depth understanding of raw material preferences and material attributes. The studies were executed at

Christiansburg and Tysons Corner, two cities in Virginia, and Madison and Florence in Wisconsin. Individuals were solicited to evaluate the 38 end-tables during a 1-month period, mainly on the weekends. Each subject was paid $10 as an incentive. One-third of the end-tables per week were evaluated to reduce the risk of subject information overload. Subjects evaluated the tables on the basis of species, grain, grain patterns, and color. Later manipulations addressed such variables as country-of-origin and willingness to pay (i.e., price points).

We explored within-group variations by contrasting the tables, demographic variables, country-of-origin manipulations, table/country assessment, and price points to determine the nature of the relationships among variables. Between-group comparisons were accomplished by using several demographic variables (e.g., gender, income, education, and location). Within and between-group contrasts using ANOVA and MANOVA provided relevant information regarding preferences. Analysis also included multidimensional scaling to detect meaningful underlying dimensions that could explain observed similarities or dissimilarities. We also used factor analysis to assess table similarities.

RESULTS AND DISCUSSION

Data collection and analysis are still being completed. Our findings can be linked directly back to the forest as preference data for ring density and texture (i.e., grain) can be applied in the forest by forest managers.

Knowing preferred attributes affords timber manager the opportunity to manage hardwood forests with the final consumer in mind. Additionally, significant competitive advantages could arise as a result of discerning attributes that differentiate eastern hardwoods. For instance, furniture, cabinet, moulding and millwork, and other value-added manufacturing industries of the eastern region would have the opportunity to take advantage of the attribute findings. Increased utilization of locally grown eastern hardwoods may result in improved employment and profitability for the eastern region's mills. Ultimately, stable or increased demand may enhance forest management practices.

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