

PRODUCT AWARENESS AND PHYSICAL RISK PERCEPTIONS OF CONSUMERS OF TREATED LUMBER

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ABSTRACT

This research examines risk, an important determinant of consumer decision-making, as a function of product awareness and physical risk perceptions. Specifically, this study addresses the risk from treated lumber products that professional and do-it-yourself retail customers perceive. In September 1985 a settlement agreement between the Environmental Protection Agency (EPA) and the wood-preservation industry regarding the use and sale of wood-treating chemicals was signed. One aspect of this agreement involved the education of consumers as to the proper use, handling and disposal of the preservative-treated lumber products. Consumer Information Sheets, the backbone of the Consumer Awareness Program, were employed to disseminate these basic safety precautions. This study measures the effectiveness of the Consumer Awareness Program by evaluating consumer awareness of the Consumer Information Sheets and evaluates the knowledge, awareness, and physical risk perceptions that retail customers have regarding treated lumber products.

Keywords: CCA, treated lumber, risk, safety, Consumer Awareness Program.

INTRODUCTION

Risk as a marketing variable

The marketing arena presents substantial insight as to how consumers incorporate risk perceptions into the decision-making process (Ross 1974). Consumer behavior as a risk-taking process was first advanced by Bauer in 1960. Since then, much empirical research has addressed this multidimensional phenomenon, and various models and theories of consumer behavior have been developed to address perceived risk (Howard and Sheth 1969; Cox 1967; Cox and Rich 1967; Bettman 1973; Taylor 1974; Spence et al. 1970; Peter and Ryan 1976). According to Cox (1967), the magnitude of perceived risk is determined by uncertainty and consequences. Taylor (1974) proposed a comprehensive risk theory in which uncertainty about the outcome may be reduced through information acquisition and uncertainty about the consequences is minimized by reducing the amount at stake or delaying the purchase decision. Risk, in a buying situation, may be viewed in terms of potential loss. Five major types of risk perceived by consumers have been identified as: functional, physical, financial, psychological, and social (Schiff-

man and Kanuk 1983). Zikmund and Scott (1973) suggested that products may be categorized in terms of the type and intensity of risk perceptions they evoke from consumers.

Physical risk may be examined in a framework that includes both technical and social issues (Slovic et al. 1981). Any system developed to protect consumers from risks associated with products must take into consideration technical factors as well as consumer psychological or internal subjective factors (Jacoby 1981). Whereas subjective or "perceived" risk is the key influence on consumer behavior, the technical or objective aspects of risk must not be overlooked. However, consumers respond only to hazards or risks they perceive (Slovic et al. 1981). Should the consumer fail to recognize that a risk exists, then behavior cannot be modified to reduce the risk (Jacoby 1981).

Technical issues

Technical issues involve the identification of hazards and the measurement of these hazards in terms of their probability of occurrence and severity of their consequences. These aspects have been addressed for treated lumber by the Environmental Protection Agency (EPA) in Position Document (PD) 4 (EPA 1984).

In September 1985, the EPA and the wood-preserving industry signed a settlement agreement regarding the use and sale of wood treatment chemicals. It was determined that any potential hazards should be confined largely to applicators or other exposed individuals in the treating plants. Therefore, the ensuing regulatory measures of the EPA targeted the treating industry and restricted the sale and use of the preservative chemicals to certified applicators. In essence, CCA pressure-treated lumber was deemed a safe, reliable product for retail sale and residential use, provided a few practical safety precautions were followed.

To provide the general public with these safety precautions, a Consumer Awareness Program was initiated. It featured Consumer Information Sheets to outline the proper use, handling, and disposal precautions for treated wood in matter-of-fact terminology. These Consumer Information Sheets were to be disseminated at the point of sale for all treated lumber beginning December 1985. The primary responsibility for this program lay with the wood treaters who were to ensure that Consumer Information Sheets and signs or placards reached the distributor with each treated lumber shipment (EPA 1984, p. 223). The objective of this program is to create end user awareness and thereby minimize risks.

Social issues

The social or subjective issues include the consumer's awareness or *perception* of the hazard, in this case, any physical risk associated with the CCA treated products, and the acceptability of this risk. While no study was found that examined the perceived physical risk of CCA treated products, others have examined risk acceptability from the consumer's perspective.

Slovic et al. (1981, 1980) examined the consumers' perspective of risk in association with various activities and technologies. Consumers typically perceived beneficial activities and technologies to provide higher tolerance for risk. This follows other findings that have shown that perceived risk is inversely related to perceived benefit (Rethans and Albaum 1981; Fischhoff et al. 1978).

The Consumer Awareness Program

In the fall of 1986, the EPA tested the effectiveness of the Consumer Awareness Program through a third-party audit, the Techlaw study. This independent audit process was part of a nationwide system to assure that consumers of treated lumber are aware of the proper use and precautions for using these products. Results of compliance with the Consumer Awareness Program are shown as follows (Techlaw, Inc. 1986):

Techlaw Study Results (1986):

Party Involved	% Aware of The Consumer Awareness Program	% Participating in The Consumer Awareness Program
17 formulators	100	94
61 wood treaters	100	97
69 wholesalers- distributors/retailers	81	70

Additionally, 74% of wholesalers/retailers had received written material relating to the Consumer Awareness Program, 13% had documented procedures for Consumer Awareness Program participation, and 70% distributed Consumer Information Sheets to their customers. Moreover, 6% documented their Consumer Information Sheets distribution, 57% had Consumer Information Sheets available at the time of the audit, and 32% had Consumer Information Sheets prominently displayed. The sales personnel were aware of the Consumer Awareness Program in 39 of the 69 (57%) wholesalers/retailers audited. The Techlaw study, however, was not able to survey the actual consumers' awareness of the Consumer Awareness Program.

Objectives

Given the work already done to identify and measure the potential technical risk issues arising from treated lumber products, the major goals of this paper are concerned with the social risk issues. These are to measure the consumer awareness of Consumer Information Sheets and therefore examine directly the effectiveness of the Consumer Awareness Program. Attendant to this objective is the evaluation of overall consumer knowledge and awareness in terms of (1) the chemicals used in treated lumber products, (2) brand names, and (3) the durability of treated lumber products versus competitive wood materials. Second, physical risk perceptions from a safety standpoint will be addressed to evaluate consumer acceptability of the risk posed by treated lumber products.

RESEARCH METHODOLOGY

Primary data collection was conducted via two distinct mail questionnaires aimed at two distinct retail customer groups for home centers and building materials dealers. These two groups, the professional contractor and remodeler (PRO) and the do-it-yourself'er (DIY'er), were surveyed as separate populations and are addressed and analyzed separately throughout this study.

Phase I: PRO sample design

Professional contractor populations in the U.S. have been identified by various national standardized information services (Best 1986; Zeller 1986; American Business Lists 1986). Best (1986) was instructed to merge three categories of professional contractors (single-family, home improvement, and patio/deck builders) and delete the duplications. This single category consisted of 75,734 professional contractors that comprised the total PRO population as related to this study.

Phase II: DIY sample design

According to the latest U.S. Bureau of the Census figures, there were approximately 89,500,000 households in the U.S. in March, 1987. Alvin B. Zeller, Inc. (1986) compiled a list of 55,000,000 households from U.S. Bureau of Census data, state and county tax records, and national insurance registers. From this listing, a systematic random sample of 5 million households was derived; these 5 million households served as the basis of the research sample for the DIY household customer.

Sampling

Mail surveys were administered, following thorough pretests, to 3,361 and 3,224 systematically selected PRO's (March 1987) and DIY'ers (October 1987), respectively, in all 50 states. This number of mailed questionnaires was estimated to provide at least 400 usable responses for each population under study, thus insuring a 95% confidence interval with an absolute error of 5% or less in the overall survey results (Mendenhall et al. 1986).

The mail survey method of data collection has shown to be the most efficient and cost-effective vehicle for securing data from a geographically dispersed population (Kanuk and Berenson 1975). A follow-up was sent approximately 10 days after the initial mailings and 543 and 491 usable questionnaires were returned from PRO and DIY respondents, respectively. After accounting for nondeliverables, this resulted in an 18% response rate for the PRO and a 17% response rate for the DIY'er. Previous studies by Franta and Johnson (1986), Boyd et al. (1981), Donald (1960), and Hochstim (1967) estimate response rates of 15% to 35% from general U.S. populations.

Nonresponse bias

Potential bias due to nonresponse can be studied in various ways. One method is to compare those who respond immediately to those who respond after follow-up steps are taken (Fowler 1984). The later respondents are generally believed to be more like non-respondents. Time-dependent relationships of eleven key demographic variables for the PRO respondents and seventeen for the DIY respondents were examined. The Chi-square test of independence was used to determine the degree of variation between early respondents (first two weeks) and those who responded later. No differences were found between early respondents and the late respondents in either group at the 0.05 level implying *no* evidence of nonresponse bias.

Telephone follow-ups to nonrespondents have also been shown to assist in the

TABLE 1. *Regional breakdown of Consumer Information Sheet responses for professional contractors and do-it-yourselfers.*

QUESTION: Can you tell me what Consumer Information Sheets (CIS's) are (as they relate to pressure treated lumber products)? Please check *one* only.

Responses	PROs (436) ¹	DIYers (303)
Don't know.	51% (224)	58% (177)
Instructions from the American Wood Preserver's Bureau (AWPB) regarding installation of Permanent Wood Foundations (PWF's).	08% (36)	07% (21)
Information distribution by bldg. supply dealers regarding proper use and disposal of treated wood. (<i>Correct response</i>)	38% (163)	23% (70)
Pamphlets from Consumer Guide magazine about which treated wood products are the best buys.	03% (13)	12% (35)

¹ Number of responses per category are in parentheses.

detection of nonresponse bias (Fowler 1984). Forty nonresponding PRO's were contacted by telephone in order to further determine if any nonresponse bias existed in our sample of 543 PRO's. The same demographic variables (except education and total sales, which are sensitive to obtain via telephone) were used to analyze nonresponse bias. The Chi-square test of independence was again employed. Results indicate that for all nine demographic variables no differences exist (0.05 level) between the respondents and nonrespondents, allowing concerns over nonresponse to be set aside.

A third, and perhaps the most accurate means by which potential bias in a sample population may be examined, is through comparisons with the population as a whole. Study limitations may be viewed by comparing our DIY respondents to the U.S. population as a whole via the 1987 *Statistical Abstract of the U.S.* Comparisons with these census records show the DIY sample used in our study is comprised of U.S. households with a higher percent of married couple households (83% versus 58% nationally) and a much higher percent of married couples with children less than 18 years old (80% versus 28% nationwide). Additionally, our sample consists of homeowners who are relatively younger, more affluent, and better educated than the general population. Thus defined, we do *not* attempt to generalize the study results to all U.S. households; simply to a segment of U.S. households. The sample identified herein, we feel, should be of considerable interest since they represent a significant market segment of more stable, knowledgeable, and active do-it-yourself treated lumber consumers. Our study found 86% of responding households have conducted DIY activities which compares favorably with a Home Center Research Bureau study (1984) that showed 85% of households reporting DIY activity.

MEASUREMENT OF CUSTOMER KNOWLEDGE/AWARENESS

Consumer Information Sheets

To measure consumer awareness/knowledge of Consumer Information Sheets, the PRO and DIY respondents were asked: "Can you tell me what Consumer Information Sheets are? (as they relate to pressure-treated lumber products)" (Table 1). Only those PRO's who used pressure-treated lumber products in 1986

TABLE 2. Knowledge/awareness measures for professional contractors and do-it-yourselfers.

Knowledge/awareness items:	PROs	DIYers
Percent of respondents who:		
Know what Customer Information Sheets are (multiple choice)	38%	23%
Know the chemicals used (aided recall)	31%	37%
Can recall (unaided) at least one brand of treated lumber	33%	18%
Number of years the following materials last (maintain structural strength) in weather exposed above ground uses:		
Treated lumber products (average)	28 yr	25 yr
Naturally durable species (i.e., cedar & redwood) (average)	22 yr	21 yr
Untreated lumber products (i.e., pine, spruce, Douglas fir) (average)	8 yr	7 yr

(80% or 436 of the 543 respondents) and only the DIY'ers who have used or purchased pressure-treated lumber products in the last three years (62% or 303 of the 491 respondents) were asked to answer this question. An opportunity to check a blank labeled "I really do not know what Consumer Information Sheets are" was provided, as well as three additional multiple choice answers of which only one was correct. Slightly over half of all PRO's stated that they didn't know what Consumer Information Sheets were. An additional 11% chose one of the two incorrect responses and only 38% chose the right answer. Moreover, well over half (58%) of all DIY'ers checked the "don't know" response. An additional 19% chose one of the two incorrect responses; only 23% chose the right answer.

These results suggest that nearly two-thirds of builders and over three-quarters of DIY'ers who have used treated lumber products do not know what Consumer Information Sheets are.

Chemicals

Approximately one-third of retail treated lumber customers (31% of PRO's and 37% of DIY'ers) could identify the chemicals used in treated lumber products (Table 2). This was an aided recall, however, with no incorrect responses provided. Therefore, responses are considered to be perceptions of knowledge. Approximately 95% of treated lumber products at the retail level contain the preservative CCA (Micklewright 1988); however, of the 31% of PRO's responding to this question, only 61% indicated CCA was used. Similarly, only 64% of responding DIY'ers indicated that CCA was the preservative chemical used to treat the treated lumber they used/purchased.

Brand names

Of eleven different risk relievers identified by Roselius (1971), "brand loyalty" and "major brand image" were ranked as first and second, respectively, as relievers of the four types of losses or risks. This study shows that only one-third of PRO respondents and about one-fifth of DIY respondents could recall unaided at least one brand of treated lumber (Table 2).

Durability

To evaluate the respondents' perception of lumber durability, a question was phrased as follows: "Based on your best guess, how many years would you say the following three materials (pressure-treated, untreated, and cedar/redwood

TABLE 3. *Physical risk perceptions of professional contractors.*

	Frequency of response ¹					Mean score
	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	
CCA treated lumber is safe to resident for outdoor applications	1%	5%	20%	60%	14%	3.81
With proper use, handling and disposal of CCA treated lumber it is entirely safe	3%	6%	36%	48%	7%	3.53
CCA treated lumber is safe to the builder	7%	14%	39%	37%	3%	3.15
CCA treated lumber is safe to resident for indoor applications	7%	21%	37%	32%	3%	3.04
CCA treated lumber emits odors	4%	29%	42%	22%	3%	2.90
CCA treated lumber is safe for countertops and butcher blocks	45%	30%	22%	2%	1%	1.84

¹ Frequency based on 445 responses for each of seven risk items.

lumber products) last or maintain structural strength in weather exposed above ground uses?" Treated lumber was rated as 27% and 19% longer lasting versus naturally durable species such as cedar and redwood by PRO's and DIY'ers respectively (Table 2).

MEASUREMENT OF PERCEIVED PHYSICAL RISK

The perceived physical risk associated with treated lumber products was measured by asking respondents to indicate their level of agreement or disagreement to six (seven for the DIY'er) statements relating to the safety of CCA treated lumber products (Tables 3 and 4). Overall, the strongest agreement from DIY respondents emerged from the statement "I would like more information on the proper use, handling, and disposal of treated lumber." The strongest agreement for PRO's and the next strongest for DIY'ers resulted from the two statements: "Treated lumber is safe to the resident for outdoor applications" and "Given the proper use, handling, and disposal of treated lumber products, these materials are entirely safe." DIY consumers agree more than PRO's that "Treated lumber

TABLE 4. *Physical risk perceptions of do-it-yourself respondents.*

	Frequency of response ¹					Mean score
	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	
I would like more information on proper use, handling and disposal of CCA treated lumber	3%	7%	21%	49%	20%	3.75
CCA treated lumber is safe to resident for outdoor applications	1%	7%	25%	58%	9%	3.69
With proper use, handling and disposal of CCA treated lumber it is entirely safe	0%	5%	35%	51%	9%	3.64
CCA treated lumber is safe to the DIY'er	1%	11%	39%	43%	6%	3.43
CCA treated lumber is safe to resident for indoor applications	7%	25%	48%	19%	1%	2.83
CCA treated lumber emits odors	6%	29%	46%	18%	1%	2.81
CCA treated lumber is safe for countertops and butcher blocks	22%	23%	47%	7%	1%	2.41

¹ Frequency based on 463 responses for each of eight risk items.

products are entirely safe to the user (builder/DIY'er) that frequently uses these materials." Both consumer groups were generally neutral in terms of the safety of treated lumber for indoor applications and the statement that CCA treated lumber emits odors. Finally, both groups disagreed (PRO's relatively more than DIY'ers) that treated lumber can safely be used for countertops and butcher blocks.

ADDITIONAL CONCERNS

PRO's

PRO's were provided an opportunity to express any additional concerns that they may have regarding the EPA's approval of CCA treated lumber products following a 10-year study. This question was structured as open-ended to encourage sincere concerns and responses. Haller (1983) and Fowler (1984) present a strong case for the advantages of using open-ended questions to provide insight into true consumer perceptions and to elicit unanticipated responses.

Only 15% or 82 of the 843 responding builders answered this question. The most common response (22 of 82) was "no concerns." The most frequent concern noted was user safety (20 of the 82 responses) in terms of the risk to the builder/resident from skin contact or leaching and the long-term effects of exposure. Other related safety concerns included: inhalation dangers from sawdust and fumes, a general lack of knowledge, awareness of the safety precautions and consequences, suspicion of the Environmental Protection Agency (EPA), durability concerns, unacceptable product quality, disposal precautions, and risk to children for playground applications.

DIY'ers

For household respondents, the additional concerns question was much more global. Specifically, the open-ended question was worded as follows: "As a past, present, or potential consumer of CCA pressure treated lumber products, do you have any general comments or concerns about these products in terms of quality, availability, service, safety, etc.?" Only the safety issue, the topic of greatest response, will be addressed in this paper.

Forty-one percent or 202 of the 491 DIY respondents answered this question. Clearly, the topics of greatest concern for DIY respondents related to user safety such as chemical concerns, lack of product awareness and desire for information on product usage, handling and disposal, with 45% or 90 of the 202 responses addressing these issues. The most prevalent responses in this category included: "a general concern over safety and health hazards" (24 responses); "give out more information on usage, handling, and disposal precautions" (15 responses); "I need more information on the safety of the chemicals used" (14 responses); and "is treated lumber safe for: burning, inhaling sawdust, children who play around it, animals to chew on it" (11 responses).

DISCUSSION

Consumer awareness

The findings of this study indicate that only 38% of the 436 PRO respondents and 23% of the 303 DIY respondents who have used treated lumber products from 1985–1987 could successfully identify the correct response from a multiple choice question that described the Consumer Information Sheets. These Consumer Information Sheets serve as the main vehicle for conveying information about

treated wood to purchasers of treated lumber products and to the end-users (EPA 1984). According to Kelleher (1986), many retailers are still uninformed and/or confused about the safety issue and their customers know even less.

Chemical awareness by retail customers is also quite low. This study estimates that only about one-third of PRO and DIY respondents could identify the preservative chemicals used in the products they purchased.

Brand name awareness was very low, indicating the ineffective use of this marketing tool. A brand name serves to identify the product or service and differentiate it from competitors (Evans and Berman 1982). Further, brand names can act as risk relievers in the purchase decision. Especially for treated lumber products, which are on display in homeowner's backyards, many treaters, manufacturers, and retailers feel that an effective brand name would constitute an effective risk reduction strategy. Roselius (1971) found the three risk relievers of brand loyalty, major brand image, and government testing to rank 1st, 2nd and 3rd, respectively for reducing the perception of hazard or physical loss. These mechanisms are used by consumers to reduce the perceived risks affecting their decisions.

Durability

Durability or resistance to decay and insects is the primary selling point that differentiates treated lumber products in the consumer's mind from nontreated lumber. This product attribute, representing a functional risk (i.e., it might decay) to potential consumers, may be a primary means of communicating a competitive advantage to retail customers. When a treated lumber application is considered, the entire set of product alternatives is most likely limited to just a few alternatives such as treated lumber, untreated lumber, naturally durable species, and perhaps concrete.

Treated wood generally has a useful life at least 5–10 times longer than untreated wood (EPA PD 4 1984; FPL 1987). This study indicates that treated lumber products are perceived as less than 4 times as durable in weather exposed above ground applications than comparable untreated lumber. This is perhaps a conservative perception among users that could be improved by promotional address. Additionally, PRO and DIY respondents feel that treated lumber lasts an average of 6 and 4 years longer, respectively, than naturally durable species such as redwood and cedar.

One potential communication strategy aimed at reducing this functional risk to retail customers may be in emphasizing the relative uniformity of decay resistance afforded by treated lumber. Natural decay resistance in untreated lumber limited to the heartwood of durable species, depends on the nature and amount of fungitoxic extractives present (Haygreen and Bowyer 1982). Furthermore, this amount varies considerably within a species, and with location, age and rate of growth of the tree (Haygreen and Bowyer 1982). This creates a functional durability variability or uncertainty for the consumer that is not present to the same degree in CCA treated lumber products.

Physical risk perceptions

The findings from the risk opinion statements indicate a general state of apathy toward physical risk from treated lumber. On a scale of 1 to 5, mean ratings for 12 out of 13 risk items ranged from a high of 3.81 to a low of 2.41. The only

statement receiving an extreme mean rating (1.84), and only by PRO respondents, was “CCA pressure treated lumber can safely be used for countertops and butcher blocks.” This general level of apathy probably suggests a lack of knowledge and awareness by these two groups of retail customers. Further evidence of limited consumer knowledge emerges from an examination of the frequency of responses. Overall, a staggering 36% and 32% of DIY and PRO responses, respectively, were “neither agree nor disagree!” In fact, for the DIY’ers, nearly half of the 463 responses for three of the questions: “CCA treated lumber emits odors,” “. . . safe for countertops and butcher blocks” and “. . . safe for indoor applications,” had no opinion!

This lack of knowledge creates a very unstable situation for the wood-treating industry for two reasons. First, it could open the door for the Consumer Awareness Program to become through federal action—“a more cumbersome, expensive, and time-consuming exercise in complying with federal law” (Cutler 1988, p. 6). However, more importantly, with no strong opinion regarding the physical risk of treated wood, consumers may be highly susceptible to bad publicity and negative advertisements concerning the safety of treated wood. This is clearly an undesirable situation for the treating industry.

CONCLUSIONS/OPPORTUNITIES

It is recommended that treaters, manufacturers, and retailers first identify the type of risk or loss perceived by a consumer for a specific product, then develop a suitable risk reduction strategy (Roselius 1971). Clearly, the retail customer of treated lumber products is not fully informed about the proper use, handling, and disposal of these products. Moreover, the industry may not have fully employed or adequately conveyed the risk coping strategies of brand loyalty and/or government testing. One means consumers use to reduce perceived risk is to solicit additional product information (Schiffman and Kanuk 1983). High-priced products, such as a new deck, involve a greater risk, which may necessitate a simplified communication strategy to reduce that risk. It is conceivable that available product literature such as customized Customer Information Sheets could provide a device for reducing perceived risk in the decision process.

Information search through both formal and informal sources allows the consumer to better predict the consequences of a purchase, thus reducing the level of perceived risk (Schiffman and Kanuk 1983). This implies that a competitive advantage may be garnered by successfully conveying information to the consumer. The EPA found this product to be safe to consumers given that proper use, handling, and disposal precautions are followed. A promotional strategy to educate consumers may serve to build confidence and quell potential suspicion, thus fostering a greater trust.

Treated lumber sales have increased dramatically. However, with twice the number of treating plants in the U.S. compared with 10 years ago, and the growth in demand slowing, this maturing product line is becoming increasingly competitive (Caswell 1987). In order to maintain a competitive advantage, firms will need to pursue market related strategies. One such strategy, brand naming, may provide a significant reduction in risk if employed successfully. Associated with a brand strategy could be the dissemination of safety precautions, such as personalized Customer Information Sheets in order to create trust between the manufacturer and the treated lumber customer.

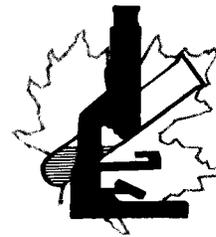
The continued success of large players in this treated lumber arena could be dictated by government intervention, consumer litigation and/or competing products with a lower perceived risk. Many opportunities for increased treated lumber sales still exist, especially for new products and in the international arena. It is time for the treating industry to actively assert itself as a consumer oriented producer.

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The Society of Wood Science and Technology is actively seeking individuals with ideas for conferences and symposia on *wood and wood related* topics. SWST would assist in the sponsorship and coordination of meetings selected by the SWST board for support. For further information contact: Dr. Barry Goodell, Wood Science and Technology, College of Forest Resources, University of Maine, Orono, Maine 04469. USA. Tel. 207 581-2843, Fax. 207 581-2898