

Character-Marked Red Alder Lumber from Southeastern Alaska: Profiled Panel Product Preferences by Residential Consumers

David Lee Nicholls
Valerie Barber

Abstract

Red alder (*Alnus rubra* Bong.) lumber is widely used to produce furniture and other secondary wood products. Tongue and groove (T&G) paneling is a product with potential niche applications and requires relatively small investments in processing equipment. As such, it represents potential business opportunities for smaller wood products manufacturers in Alaska. This study considered red alder paneling with various levels of character marks, ranging from clear wood to high levels of character. Residential consumers evaluated four panels in Anchorage and Fairbanks, Alaska, and selected their overall favorite panels for potential use in their homes. Character marks, grain consistency, and color also were evaluated for all panels. Statistically significant differences were found between male and female respondents in their attribute ratings for three of the four panels and in color attribute ratings between Anchorage and Fairbanks respondents for the panels with high levels of character. For all four panels, highly significant differences in mean ratings were found among the three attributes (character marks, grain consistency, and color). Market location was generally more significant than gender in influencing attribute ratings. These results suggest that even though strong preferences may exist for clear wood in T&G panels, consumers are able to perceive and rate character mark features differently.

Red alder (*Alnus rubra* Bong.) lumber is widely used to produce furniture and other secondary wood products. An estimated 450 million board feet of red alder lumber was sawn at Washington and Oregon sawmills in 2002 (LeBlanc 2004). Red alder has also been an important export species. In 2008, close to 60.6 million board feet of red alder lumber, having an average value of \$803 per thousand board feet, was exported from the western United States (Warren 2009). Rustic red alder, in which knots and other character features are included for their desirable appearance, is becoming increasingly important in regional and national markets and is now featured at major home centers for a variety of products, including kitchen cabinets and interior doors.

Despite these trends, essentially no red alder from southeastern Alaska is processed into secondary wood products. Niche markets for red alder could potentially include high-value cutting blocks, pallets, cut-stock parts, and specialty steam-shaped furniture components (Green et al. 1995). Tongue and groove (T&G) paneling, another product with niche product applications, would require relatively small investments for processing equipment, such

as moulders, which are essential for the production of T&G panels. Several Alaskan firms producing T&G products (mostly from softwood species) have been identified (Parrent 2004). In 2004, an estimated 13 moulders were operating in Alaska at sites that also had lumber dry kilns (Nicholls et al. 2006). Six of these moulders were located in southeastern Alaska, the only region where red alder sawlogs would be locally available.

Given these market trends and equipment requirements, T&G panel production could represent an attractive business opportunity for sawmills in Alaska that are already producing lumber from other species. Important elements of a successful marketing effort for T&G panels will include identifying preferences for the overall levels as well as types

The authors are, respectively, Forest Products Technologist, USDA Forest Serv., Sitka, Alaska (dlnicholls@fs.fed.us); and Assistant Professor, Forest Products Program, Univ. of Alaska–Fairbanks, Palmer (vabarber@alaska.edu). This paper was received for publication in June 2010. Article no. 10-00017.

©Forest Products Society 2010.
Forest Prod. J. 60(4):315–321.

of character marks most appealing to consumers. In this article, we evaluate both of these elements for residential consumers in Alaska's two largest markets.

Red Alder in Alaska

In Alaska, red alder occurs in the southeastern part of the state and is capable of reaching sawtimber size in as little as 50 years (Brackley et al. 2009). Smaller stems, characterized by a high proportion of knots, can result in lumber with high levels of character features; however, markets for this material have not yet been developed. Red alder harvested from a stand near Ketchikan, Alaska, was found to range in diameter from about 8 to 17 inches and yielded close to 41 percent of the total lumber volume within frame-grade material (Brackley et al. 2009). This finding illustrates the need to locate markets for lower grades of lumber.

In a recent study, both character marks and design were important to residential consumers in Alaska when evaluating red alder furniture that contained character marks (Bumgardner et al. 2009). Character marks, including knots and natural stain, also may play an important role in preferences by residential consumers for red alder edge-glued panels (Nicholls et al., in press). However, for red alder T&G paneling, little is known regarding the size, type, and extent of character marks preferred by consumers, and given that this is an interior product, appearance features could be very important. Currently, no sawmill in Alaska is commercially producing red alder lumber, so certain niche applications (e.g., rustic cabin interiors) could represent good start-up opportunities for interested producers. However, consumer preferences for specific appearance features will first need to be identified.

Methods

Character-marked lumber was selected from a red alder product recovery study that processed trees harvested near Ketchikan. That study resulted in close to 6,300 board feet of kiln-dried, planed red alder lumber from 44 trees (Brackley et al. 2009). In the current study, red alder T&G panels were constructed using lumber from the previous product recovery study, and the panels included a wide variety of grades, ranging from clear wood (Superior grade lumber) to high levels of character (Economy Frame Grade lumber). The lumber grades we used were developed by a hardwood lumber-producing firm in the Pacific Northwest and, therefore, were a departure from standard National Hardwood Lumber Association grades (Cascade Hardwoods 2008, Brackley et al. 2009).

Each sample panel was composed of lumber from only one grade. Character mark features typically included knots, bark pockets, natural stain, spike knots, and checks within knots. In a few cases, unsound knots or knot holes were also included (Fig. 1).

We evaluated two research questions based on responses from residential consumers:

1. Which level of character in red alder T&G panels is preferred, based on lumber grade?

- Panel A, Grade 2 (Cabinet & Custom Shop) lumber
- Panel B, Grade 5 (Economy Frame) lumber
- Panel C, Grade 1 (Superior) lumber
- Panel D, Grade 3 (Common Shop) lumber

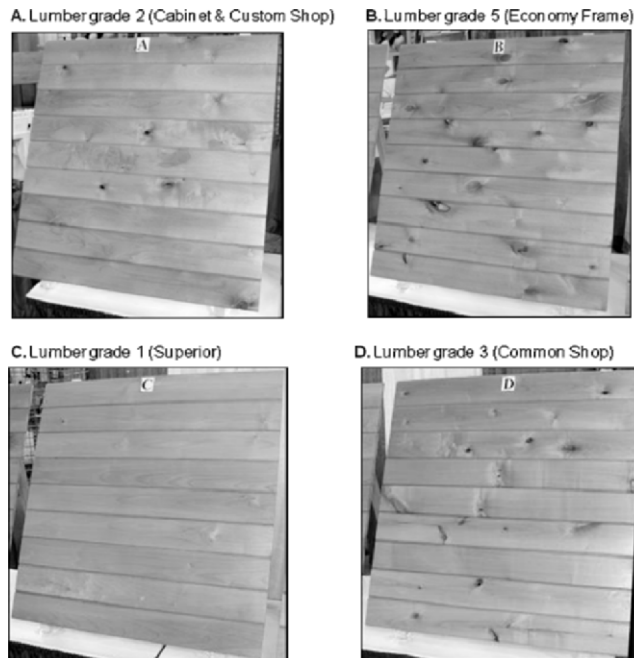


Figure 1.—Red alder character-marked panels as displayed at a woodworking expo in Fredericksburg, Virginia.

2. How are the following visual characteristics rated, and what is their relative importance?

- Character marks
- Grain consistency
- Overall color

A total of four panel samples were constructed, all from different grades of lumber, as described above (Fig. 1). The panels were constructed from T&G lumber into samples very similar to wall paneling having standard 4-inch-wide profiled lumber (Fig. 1). Completed panels measured about 3 by 3 feet, and each contained nine rows of lumber. Although this panel size was considerably smaller than those used in actual homes (i.e., where an entire wall would likely be covered), this size was thought to allow a representative sampling and distribution of character marks while still being small enough for transport to different sampling locations. Samples were finished with a clear-coat finish, which did not influence overall color and which preserved the integrity of the character features. No other stains were applied. Samples were mounted together on one display table to facilitate side-by-side comparisons within display booths.

Responses were received at two different home shows in Alaska, resulting in a total of 465 usable responses (Anchorage, $n = 160$; Fairbanks, $n = 305$). Interested passersby who approached the display booth were asked if they would like to complete a brief survey (no second effort was made). At each location, several people were involved with survey administration, indicating possible variation from different presentation styles. However, presenters offered the same survey and greeted home show attendees in the same manner, regardless of location. Furthermore, attendees seemed to focus most of their attention on the panel displays (and not the presenter) during the initial part of the survey. Therefore, any bias resulting from how

respondents perceived different presentation styles or approaches should be negligible. Our study used a “convenience sample” of home show attendees in Anchorage and Fairbanks. Therefore, our study results cannot be generalized to the population at large, which could include people who are uninterested or unable to attend these home shows.

Residential consumers indicated their preferences in a two-part survey. In Part 1, they selected their overall favorite from the group of four panels, each having different levels of character marks. Here, residential consumers selected panels based on potential use in their homes. In Part 2, they rated panels for character marks, grain consistency, and color on a 5-point Likert scale, ranging from excellent to poor. Again, they rated panel attributes based on their personal preferences (as if they would be purchasing them). Because we used parametric tests to evaluate the Likert scale results, an implicit assumption was that the data were interval scaled (rather than ordinal scaled). We believe this is reasonable given that the Likert scales were identified on surveys as “excellent,” “good,” “neutral,” “fair,” and “poor” and, therefore, could easily be interpreted by respondents as being equally spaced between adjacent categories.

For residential consumers, demographic information regarding gender, age, and income was also sought. None of the panels were explicitly identified as to type or extent of character marks; therefore, respondents had no preconceptions about the features they were evaluating. All surveys were conducted in partnership with the University of Alaska–Fairbanks (UAF), Forest Products Program. Survey questions and format were reviewed and approved by the UAF Institutional Review Board before data collection.

Results and Discussion

Overall panel preferences

By location.—Residential consumers preferred Panel C (made from defect-free wood) by a wide margin (Table 1). Panel B (Economy Frame Grade wood), which had the highest frequency of character marks, was least often selected as favorite. Panels A and D, constructed from intermediate grades of lumber, were preferred at intermediate levels. Residential consumers in Fairbanks preferred Panel C (clear wood) less often than did respondents in Anchorage. In general, Fairbanks respondents showed a more uniform distribution in preferences between panels

Table 1.—Preferences for character-marked red alder tongue and panels expressed by survey respondents at two locations in Alaska.^a

Panel ^b	Anchorage		Fairbanks	
	Count	% of time selected as favorite	Count	% of time selected as favorite
A	22	14.1	54	18.3
B	7	4.5	17	5.8
C	102	65.4	136	46.1
D	25	16.0	88	29.8
Total	156	100	295	100

^a $\chi^2 = 16.33, P < 0.005; df = 3.$

^b Panel A, lumber Grade 2 (Cabinet & Custom Shop); Panel B, lumber Grade 5 (Economy Frame); Panel C, lumber Grade 1 (Superior); Panel D, lumber Grade 3 (Common Shop).

Table 2.—Preferences for character-marked red alder T&G panels for residential consumers in Alaska (Anchorage and Fairbanks combined data).^a

Panel ^b	Male		Female	
	Count	% of time selected as favorite	Count	% of time selected as favorite
A	41	16.7	29	15.7
B	12	4.9	12	6.5
C	134	54.7	92	49.7
D	58	23.7	52	28.1
Total	245	100	185	100

^a $\chi^2 = 1.854, P > 0.10; df = 3.$

^b Panel A, lumber Grade 2 (Cabinet & Custom Shop); Panel B, lumber Grade 5 (Economy Frame); Panel C, lumber Grade 1 (Superior); Panel D, lumber Grade 3 (Common Shop).

versus Anchorage respondents, indicating a greater tolerance for character marks. Results of a χ^2 analysis indicate significant differences between cells ($P < 0.005, df = 3$; Table 1).

By gender.—Panel preferences for male versus female respondents were combined for the Anchorage and Fairbanks locations. For this pooled data, both male and female residential consumers preferred Panel C (clear wood construction) by a wide margin, with stronger preferences by male respondents (Table 2). Panel D (Common Shop lumber) was more often selected as the preferred panel by female versus male respondents. In general, female respondents showed somewhat stronger preferences for panels with higher levels of character (Panels B and D) versus male respondents. This finding contradicts previous research (Donovan and Nicholls 2003) in which women were more likely to prefer clear wood for kitchen cabinets constructed from Alaska birch. For the current study, results of a χ^2 analysis indicated no statistical differences between cells ($P > 0.10, df = 3$; Table 2). When considering Anchorage and Fairbanks combined, about 57 percent of the respondents were male, and 43 percent were female (Table 3).

Preferred panel attributes

Overall results.—Respondents evaluated each of the four panels based on three wood attributes (character marks, grain consistency, and color) using a 5-point Likert rating scale. Results were expressed in terms of mean attribute ratings (Tables 4 through 6). The clear lumber used in Panel C had the most favorable attribute ratings as well as the most consistency among attributes. All three attributes were

Table 3.—Demographic information for residential consumers evaluating red alder panels (Anchorage and Fairbanks, Alaska, combined).

Gender	% of total	Age (y)	% of total
Male	57.1	18–30	8.8
		31–40	12.2
		41–50	32.4
		51–60	31.1
		61–70	10.8
Female	42.9	>70	4.7
		Total	100

Table 4.—A comparison of average preference ratings expressed by male versus female respondents for three attributes in red alder T&G panels.

Panel	Frequency of character marks	Attribute evaluated	Mean attribute rating (1 = excellent, 5 = poor)			Significance ^a
			Male respondents	Female respondents	<i>t</i>	
A	Moderate (low)	Character marks	2.3	2.3	0.062	0.951
		Grain consistency	2.8	2.5	2.580	0.010 ^b
		Color	2.2	2.2	0.052	0.958
B	Very high	Character marks	3.1	3.1	0.219	0.827
		Grain consistency	3.0	2.8	1.359	0.175
		Color	2.5	2.5	0.191	0.849
C	None	Character marks	2.1	2.2	0.786	0.433
		Grain consistency	1.7	1.9	1.825	0.069 ^c
		Color	1.8	1.8	0.070	0.944
D	Moderate (high)	Character marks	2.2	2.1	1.131	0.259
		Grain consistency	2.4	2.3	1.268	0.206
		Color	2.2	2.0	2.582	0.010 ^b

^a A Bonferroni correction was used to protect against type I error, indicating a threshold of 0.004.

^b Pairwise comparison between male and female respondents significant at the 0.01 level.

^c Pairwise comparison between male and female respondents significant at the 0.10 level.

rated more favorably for Panel C than for any other panel. An important anecdotal finding was the high popularity of “birds-eye” patterns in Panel A (Fig. 2).

By gender.—Donovan and Nicholls (2003) found that women were more likely than men to prefer clear wood when evaluating character-marked birch kitchen cabinets in Alaska. Brinberg et al. (2007) also found gender differences in perceptions of character-marked furniture. Thus, customized marketing strategies could be used for women and for men. In the current study, male and female residential consumers in Alaska gave different attribute ratings for several panels (Table 4). The *t* test results indicated statistical differences between male and female respondents for all panels except Panel B (Economy Frame Grade lumber). Significant differences were also found between male and female respondents for the grain consistency

attribute of both panels having low levels of character (Panels A and C; Table 4).

By Alaska location.—Residential consumers in Anchorage and in Fairbanks showed significant differences in mean attribute ratings based on *t* test comparisons (Table 5). Three panels (Panels B, C, and D) showed highly significant differences between locations for character mark ratings, whereas Panel A showed no significant differences between locations. For all paired comparisons (Tables 4 and 5), a Bonferroni correction was used to protect against type I error, using an experimentwise error rate of 0.05.

For the higher levels of character (Panels B and D), Fairbanks respondents gave more favorable attribute ratings to character marks than did Anchorage respondents. Although character mark attribute ratings were significantly different between Anchorage and Fairbanks for Panel C (clear wood construction), this result was likely based on features such as grain variations or very small knots rather than more noticeable features, such as bark pockets, knots, and natural stain (Fig. 1). Statistically significant differences were found in color attribute ratings between Anchorage and Fairbanks respondents for Panels B and D, which were constructed from the lower grades of lumber (i.e., highest levels of character; Table 5).

For Panel D (Common Shop lumber), all three attributes showed highly significant differences between groups (Fairbanks respondents vs. Anchorage respondents). It should be mentioned that although Panel C was constructed from defect-free wood, it still contained visible grain patterns that could have been interpreted as character features by respondents (Fig. 3). This idea is supported by the difference in character mark attribute ratings for Panel C between Anchorage and Fairbanks residential consumers (Table 5).

Importance of character marks

Wang et al. (2004), using conjoint analysis to evaluate the market potential for fine furniture constructed from low-grade hardwoods, found that character-marked furniture was acceptable to a large percentage of respondents, but that the design must be attractive. Swearinggen et al. (1998),

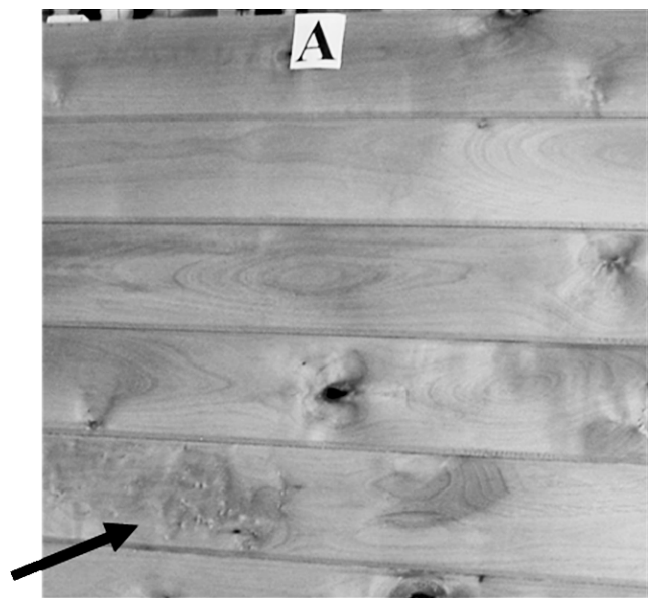


Figure 2.—The “birds-eye” figure (arrow) was often mentioned as a preferred feature by respondents; however, it was not evaluated directly in the current study.

Table 5.—A comparison of average preference ratings expressed by Anchorage versus Fairbanks residential consumers for three attributes in red alder T&G panels.

Panel	Frequency of character marks	Attribute evaluated	Mean attribute rating (1 = excellent, 5 = poor)			Significance ^a
			Anchorage respondents	Fairbanks respondents	<i>t</i> (2-tailed)	
A	Moderate (low)	Character marks	2.3	2.3	0.596	0.551
		Grain consistency	2.8	2.6	1.029	0.304
		Color	2.2	2.1	0.505	0.614
B	Very high	Character marks	3.4	3.0	2.967	0.003 ^b
		Grain consistency	3.1	2.8	2.329	0.021 ^c
		Color	2.7	2.4	3.401	0.001 ^b
C	None	Character marks	1.9	2.2	-3.214	0.001 ^b
		Grain consistency	1.7	1.8	-1.135	0.257
		Color	1.9	1.8	0.347	0.729
D	Moderate (high)	Character marks	2.4	2.0	3.501	0.001 ^b
		Grain consistency	2.6	2.3	2.875	0.004 ^b
		Color	2.3	2.0	3.255	0.001 ^b

^a A Bonferroni correction was used to protect against type I error, indicating a threshold of 0.004.

^b Pairwise comparison between Anchorage and Fairbanks respondents significant at the 0.01 level.

^c Pairwise comparison between Anchorage and Fairbanks respondents significant at the 0.05 level.

evaluating consumer preferences for Pacific Northwest hardwoods, found general preferences for woods having character features, because this conveyed a sense of “real wood” to consumers. Jahn et al. (2001), studying consumer preferences for character-marked hardwood cabinet doors, reported that character features were not important to 73 percent of those sampled. That study also showed that younger, female respondents tended to be less receptive to the presence of character marks. Broman (2001) found that Swedish respondents tended to balance the degree of harmony and activity when evaluating knots in Scots pine (*Pinus sylvestris* L.) samples. Donovan and Nicholls (2003) reported that distinctive character marks on Alaska birch cabinet doors could command a price premium and possibly may appeal to a smaller proportion of the population than would doors having fewer or less distinctive character marks. In general, doors with high levels of grain variation or character marks were most appealing to residential consumers, whereas doors with moderate levels of character

were preferred less often. These studies demonstrate the importance that character marks can have in forming consumer perceptions about wood products and willingness to pay.

In the current study, character marks were highly significant when comparing Anchorage and Fairbanks respondents (Table 5) and less significant when comparing male and female respondents (Table 4). Panel B (Economy Frame Grade lumber) had at least one “severe” character mark where a visible hole was present. A number of respondents provided negative comments about this hole specifically and about other character marks having irregularities that could detract from a smooth, finished surface. This suggests the importance of smooth (integral) features for character marks, and it agrees with the findings of Jonsson et al. (2008) that smoothness can be a preferred core category when evaluating solid wood, wood-based panels, and composites.

The current study contradicts somewhat the findings of Wang et al. (2004), who found that density of character marks was the least important of four attributes studied (design, price, and guarantee policy were all rated as more important). In that study, conjoint analysis was used to evaluate fine furniture from low-grade hardwoods, with 12 chairs being constructed from either clear wood, wood with a medium density of character marks, or wood with a heavy density of character marks. A key finding was that even though character-marked furniture was acceptable to a large proportion of respondents, an attractive design was important. Likewise, Brinberg et al. (2007) found that design was a significant model coefficient for consumer perceptions of oak and cherry furniture.

Importance of color

Color can be an important attribute for secondary wood products. Alderman et al. (2007) found “attractive color” to be the highest rated of nine lumber attributes when wood products firms evaluated eastern white pine (*Pinus strobes* L.) lumber. Color was also important when considering white oak (*Quercus alba* L.) edge-glued furniture products (Phelps et al. 1994), with an emphasis on lighter-colored

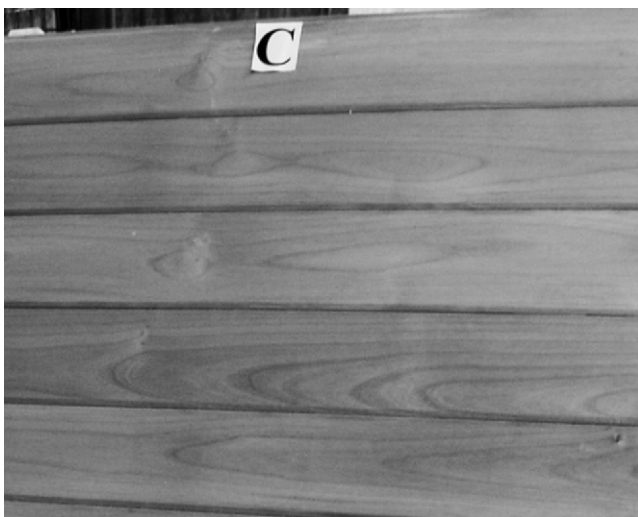


Figure 3.—A cathedral grain pattern is evident in red alder Panel C (clear wood).

Table 6.—Comparison of attribute ratings for red alder T&G panels by residential consumers in Alaska.

Panel	Frequency of character marks	Mean attribute rating (1 = excellent, 5 = poor) ^a			F ^b
		Character marks	Grain consistency	Color	
A	Moderate (low)	2.3 A	2.7 AB	2.2 B	34.658
B	Very high	3.1 A	2.9 B	2.5 AB	32.369
C	None	2.1 AB	1.8 A	1.8 B	16.581
D	Moderate (high)	2.1 A	2.4 AB	2.1 B	9.517

^a Values within a row that share the same letter are significantly different at the 0.05 level using the Bonferroni post hoc multiple comparison test.

^b All values are significant at the 0.01 level.

boards. Bumgardner and Bowe (2002) found that respondents used color to form perceptions about wood. In that study, darker woods were rated as expensive and stately, whereas lighter woods were generally rated as inexpensive, casual, and modest. Color can also be modified by applying commercial stains to wood. Nicholls and Roos (2006) evaluated residential consumer preferences for seven red alder kitchen cabinet doors, all stained to a different level of darkness. Those authors indicated that demographic factors (gender, age, and income) of residential consumers generally did not influence preferences for a given cabinet; however, the effect of market location was significant.

Wood color in red alder is also important to wood products producers because of its tendency to turn from pale to light brown or orange shortly after harvest. Thus, many mills will carefully regulate the amount of time between sawing and kiln drying (so that lumber can undergo a desired level of color change). These color variations can make wood undesirable for use in cabinets and furniture (Kozlik 1987, Simpson 1991). However, because lower grades of lumber may be characterized by greater color variation, consumer acceptance could become an important factor for (or potential barrier to) increasing yields from lower lumber grades (Smith et al. 2004).

In the current study, both male and female respondents rated overall color favorably for Panel A (low level of character) and for Panel C (clear wood; Table 4). However, when comparing male versus female respondents, color was statistically significant only for Panel D (Table 4). Because Panels A and C had considerably higher proportions of clear wood than the other panels, it appears that respondents' perceptions of color could be influenced by the size and frequency of character marks (most of which were considerably darker than the surrounding clear wood). When comparing Anchorage respondents versus Fairbanks respondents, color was statistically significant for panels with very high character (Panel B) or moderately high character (Panel D; Table 5). For the panels having few or no character marks (Panels A and C), color was not statistically significant in comparisons between Anchorage and Fairbanks respondents.

Relative importance of wood attributes

Different wood attributes can be valued differently for different species, even within a region. For example, Swearingen et al. (1998) found that among Pacific Northwest consumers, knots were desired in bigleaf maple (*Acer macrophyllum* Pursh), whereas grain variation was desired in Oregon white oak (*Quercus garryana* Douglas ex Hook.). In the current study, statistically significant differences were found among attributes for all four panels (Table 6). Mean attribute ratings for character marks, grain

consistency, and color were compared for each panel individually, using pooled data for Anchorage and Fairbanks residential consumers. For all panels, *F* values were highly significant (at the 0.01 level), indicating at least one pairwise difference among attributes. In all cases except Panel B (very high level of character), ratings for character marks were significantly different from ratings for grain consistency, and ratings for grain consistency were significantly different from ratings for color, in all cases except Panel C. All pairwise comparisons were evaluated using the Bonferroni post hoc multiple comparison test. These findings suggest that residential consumers are able to distinguish different types of character mark features. This could become an important marketing consideration if different features were combined to customize the overall appearance of T&G panels.

Summary and Conclusions

Strong preferences were indicated by residential consumers in Alaska for defect-free red alder when used in T&G panels. Panels with high levels of character marks were preferred considerably less often. This preference for clear wood underscores the importance of customizing products to accurately reach consumers. However, this finding somewhat contradicts past research in which Alaska consumers were found to prefer cabinet doors with knots, color variation, and generally high levels of character marks (Donovan and Nicholls 2003).

Because the current study found statistically significant differences in mean attribute ratings between residential consumers in Fairbanks and Anchorage, the importance of market customization, even for markets within a state, is recognized. This finding was also consistent with the results of a prior study (Nicholls and Roos 2006) that evaluated red alder kitchen cabinets made from clear wood, stained to different colors but not including character marks. Thus, one inference from both of these studies is that different consumer segments can exist within relatively small markets, even in relatively close geographic proximity.

The effect of multiple attributes can be evaluated when assessing consumer preferences for wood products. Bigsby et al. (2005) evaluated consumer preferences for wood in furniture by considering 17 combinations of species and applied stain. Those authors found that color and grain were the key wood attributes used by consumers to form preferences and that five distinct consumer segments could be identified based on these two attributes. Brinberg et al. (2007) reported that women viewed design and grain consistency positively, based on photographs of four hardwood furniture pieces. Similarly, in the current study, we observed significant differences in the way that character marks, grain consistency, and color were evaluated for all

four panels. This result suggests that consumers are sensitive to these attributes and are able to perceive them differently, even within the context of a single panel. The practical significance of this is that various combinations of character features could be included within a panel to create unique appearances most desired by a given consumer segment. However, a limitation of the current study (vs. some of the previously referenced studies) was that product design could not be evaluated directly, because the T&G panels were constructed as generic samples.

An advantage of T&G panels is that individual boards could be selected during product assembly to create customized appearances. In customization strategies, consumers can become active participants in product development, providing input into product design (Brinberg et al. 2007). This approach was used to create the test panels in the current study, and it could potentially be used for finished T&G consumer products as well.

What opportunities could be realized from the use of character-marked red alder, and what features would be most desired? Will rising prices for red alder in the Pacific Northwest create market pressures for increased use of red alder from southeastern Alaska? For wood products manufacturers considering red alder T&G panels, an important consideration would be their lumber grade distribution and the size and types of character mark features. In southeastern Alaska (Alaska's primary red alder source), lower grades of lumber are typically obtained from smaller-diameter red alder trees, and clear lumber (Superior grade) can make up less than 11 percent of the total board foot tally (Brackley et al. 2009). Thus, the ability to include knots, bark pockets, and other features in aesthetically pleasing products would appear to be a key element of successful product development and marketing. Because T&G panels would likely be used for interior applications, their appearance features could be highly valued by consumers when compared with other products having lower visibility (e.g., smaller furniture items).

If residential consumers were to favor mostly clear wood for T&G panels (as found in the current study), this could provide opportunities to utilize lower lumber grades for other product types. The practical significance of this is that lower grades of lumber, having abundant character features, could be used for products in which character marks are favored by consumers (potentially including furniture or kitchen cabinets).

Literature Cited

- Alderman, D., R. Smith, and S. Bowe. 2007. Eastern white pine secondary manufacturers: Consumption, markets, and marketing. *Forest Prod. J.* 57(10):28–35.
- Bigsby, H., C. Rai, and L. Ozanne. 2005. Determining consumer preference for furniture timber. *J. Forest Prod. Bus. Res.* 2(2). Abstract available at: <http://www.forestprod.org/jfpbr-online.html>. Accessed September 20, 2010.
- Brackley, A. M., D. Nicholls, and M. Hannan. 2009. An evaluation of the grades and value of red alder lumber in southeast Alaska. General Technical Report GTR-774. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 27 pp.
- Brinberg, D., M. Bumgardner, and K. Daniloski. 2007. Understanding perception of wood household furniture: Application of a policy capturing approach. *Forest Prod. J.* 57(7/8):21–26.
- Broman, N. O. 2001. Aesthetic properties in knotty wood surfaces and their connection with people's preferences. *J. Wood Sci.* 47:192–198.
- Bumgardner, M., D. Nicholls, and V. Barber. 2009. Character-marked furniture made from red alder harvested in southeast Alaska: Product perspectives through the supply chain. *Can. J. Forest Res.* 39(12): 2450–2459.
- Bumgardner, M. S. and S. A. Bowe. 2002. Species selection in secondary wood products: Implications for product design and promotion. *Wood Fiber Sci.* 34(3):408–418.
- Cascade Hardwoods, Ltd. 2008. Alder: Where quality begins. <http://www.cascadehardwood.com/mainfrm.htm>. Accessed May 14, 2008.
- Donovan, G. and D. Nicholls. 2003. Consumer preferences and willingness to pay for character-marked cabinets from Alaska birch. *Forest Prod. J.* 53(11/12):27–32.
- Green, D. W., W. W. von Segen, and S. A. Willits. 1995. Western hardwoods: Value added research and demonstration program. General Technical Report GTR-85. USDA Forest Products Laboratory Madison, Wisconsin. 43 pp.
- Jahn, L., M. Bumgardner, C. Forbes, and C. West. 2001. Consumer perceptions of character marks on cabinet doors. AG-617. North Carolina State University Cooperative Extension, Raleigh. 4 pp.
- Jonsson, O., S. Lindberg, A. Roos, M. Hugosson, and M. Lindström. 2008. Consumer perceptions and preferences on solid wood, wood-based panels, and composites: A repertory grid study. *Wood Fiber Sci.* 40(4):663–678.
- Kozlik, C. J. 1987. Presteaming to minimize mottling in partially air-dried red alder lumber. Research Note 80. Forest Research Laboratory, Oregon State University, Corvallis. 6 pp.
- LeBlanc, R. 2004. Outlook optimistic for red alder. <http://www.palletindustry.com/articledatabase/view.asp?articleID=1089>. Accessed February 27, 2009.
- Nicholls, D. L., A. M. Brackley, and T. D. Rojas. 2006. Alaska's lumber-drying industry—Impacts from a federal grant program. General Technical Report GTR-683. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 23 pp.
- Nicholls, D. L., M. Bumgardner, and V. Barber. Consumer and manufacturer perceptions of edge-glued panels made from Alaskan hardwoods. *Int. Wood Prod. J.* (in press).
- Nicholls, D. L. and J. Roos. 2006. Lumber attributes, characteristics, and species preferences as indicated by secondary wood products firms in the continental United States. *Holz Roh- Werkst.* 64(4):253–259.
- Parent, D. 2004. Alaska wood products manufacturers directory. JEDC Wood Products Development Service, Sitka, Alaska. 96 pp.
- Phelps, J. E., D. D. Stokke, and A. D. Pugel. 1994. Color analysis of white oak, edge-glued furniture panel stock. *Forest Prod. J.* 44(2): 35–38.
- Simpson, W. T. 1991. Dry kiln operator's manual: Drying defects. Agricultural Handbook 188. USDA Forest Products Laboratory, Madison, Wisconsin. 274 pp.
- Smith, R. L., W. Pohle, P. Araman, and D. Cumbo. 2004. Characterizing the adoption of low-grade hardwood lumber by the secondary wood processing industry. *Forest Prod. J.* 54(12):15–23.
- Swearingen, K. A., E. N. Hansen, and J. E. Reeb. 1998. Customer preferences for Pacific Northwest hardwoods. *Forest Prod. J.* 48(2): 29–33.
- Wang, Q., G. Shi, and C. Chan-Halbrendt. 2004. Market potential for fine furniture manufactured from low-grade hardwood: Evidence from a conjoint analysis in the northeastern United States. *Forest Prod. J.* 54(5):19–25.
- Warren, D. D. 2009. Production, prices, employment, and trade in Northwest forest industries, all quarters 2008. Resource Bulletin PNW-RB-258. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 163 pp.