

# FACTORS AFFECTING THE QUALITY OF WALNUT LUMBER AND VENEER

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**ABSTRACT**—Walnut is a unique species in both its timber and wood characteristics. Although market conditions vary it is generally considered a valuable species. Because of these factors, setting quality (value) levels for both lumber and veneer can be involved. Lumber grades are quantitative thus straight forward once the system is understood. Determining quality in veneer is much more subjective. This paper will discuss important factors related to quality in both lumber and veneer. Landowners, foresters, researchers, and others concerned with the production of walnut timber for lumber and veneer should consider these factors before proceeding with their work.

American black walnut (*Juglans nigra* L.) has been and continues to be a premier species for both the lumber and face veneer industries. The heartwood color is unique and once finished properly it produces an unsurpassed and unique brilliance. The wood is easily worked with hand and power tools and it is strong for its weight. As a result, it was one of our most valuable woods until the early 1970s. At that time, its value peaked (Hoover 2003), its popularity declined probably due to its cost and availability and consumers became attracted in other species. Since 1997 however, its popularity and thus value has been slowly increasing.

## LUMBER

Commercial sawmills use the National Hardwood Lumber Association (2003) grading rules for hardwood lumber to set quality and price levels for walnut lumber. These rules are quantitative. There is one general set of rules referred to as standard. Then, there are adjustments made for the characteristics and situations unique to each species. As an example, plain sawn oak is graded standard with one exception for mineral stain. For walnut, several adjustments are made to the standard rule. These adjustments allow some lumber to be moved into the higher grades which would not otherwise qualify under the standard rules. Grade for grade, the quality of walnut lumber is less than that for those species graded with the standard rule.

Factors which determine a board's grade are its width and length, size of clear cuttings which can be placed between carefully defined defects, number of clear cuttings and the percent of the board in clear face cuttings (Cassens 2001). The grade separations for walnut are FAS, FIF, Selects, No. 1 Common, No. 2A Common, No. 2B Common and No. 3 Common. The white sapwood is considered a defect unless the lumber is steamed to darken it. Steaming walnut is a standard procedure for any commercial mill producing walnut. The most significant differences between the walnut rules and the standard rule are as follows:

1. The minimum clear cutting sizes for FAS walnut are 4" x 3' and 3" x 6' compared to 4" x 5' and 3" x 7' for the standard rule.
2. The minimum board width is 5" compared to 6' for the standard rule.
3. The FAS walnut grade will admit 6' and 7' long pieces as compared to 8' and longer for the standard rule. The short pieces are graded on a defect basis. Certain defects are carefully defined and then limited by the number present and their location. The requirements for the size and number of clear cuttings and the percent of clear area are dropped for this short lumber.
4. An extra cutting is allowed for certain sized boards in the FAS grade.

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5. The FIF grade will accept 6' and 7' lumber as compared to 8' for the standard rule.
6. For FIF lumber the reverse side can be sound as defined in sound cutting or not below No. 1 Common. Sound cuttings admit small defect, holes and bird peck. The standard rule requires the reverse side of FIF lumber to grade No. 1 Common. The standard rule requires that the cuttings on the No. 1 Common side be clear face cuttings so no defects are allowed.
7. For the Selects grade the cutting sizes are reduced as for the FAS grade.
8. For No. 1 Common and No. 2A Common walnut there is no limit as to the number of cuttings allowed. The standard rule limits the number of cuttings allowed.
9. For No. 1 Common pieces with just 1' of surface measure must yield 12 cutting units as compared to being clear in the standard grade.
10. The revenue side of the cuttings in No. 1 Common and No. 2A Common only need to be sound as compared to clear in the standard grade.
11. The minimum size of cutting for No. 2A Common is 2 inches or wider containing 72 square inches as compared to 3" by 2' for the standard grade.

In summary, a load of any particular grade of walnut (except No. 3 Common) will appear to be substantially reduced from that of a species such as red oak which is graded standard. Over time, the rules for walnut have been eroded in an attempt to better utilize the available resource. However, within the last couple of years there has been an effort to remove the short lumber (6' and 7') from the upper grades. This effort which originated from a few producers was unsuccessful. However, buyers can still specify that they will not accept this material. The seller will probably ask for a premium. Anyone interested in grading walnut should refer to the National Hardwood Lumber Association (2003) grading rules and also obtain training from a qualified instructor.

### VENEER

There are several methods used to produce veneer (Cassens, 2003). Today, the most common and simplest procedure is to saw two faces on a debarked log. The log is then cut in half with each half being called a flitch. The flitches are heated to soften them. After cleaning, the flitches are

sliced into veneer ranging from about 1/32 to 1/48 inches in thickness (Fig. 1). Each sheet of veneer is kept in order and the stack of sliced veneer is also called a flitch. The veneer is then dried and clipped. After drying, and if the veneer is destined for the domestic market, three sample sheets are removed (Fig. 2). These sample sheets are examined by a potential customer to determine if he wants to purchase the entire flitch. Veneer destined for the export market has all of the waney edges clipped off and all major defects removed. The veneer from several trees is usually packed down on pallets. Veneer from the same flitch is kept together. The buyer will usually look at all of the veneer.



**Figure 1.—A veneer slicing operation showing the flitch or half log (upper right) being moved downward against a knife. The resulting veneer is being conveyed forward and stacked in order.**



**Figure 2.—Three sample sheets from a very high quality walnut flitch showing no defects, a centered cathedral pattern, and excellent color. The third sheet (right) taken from near the center of the tree is beginning to show some discoloration in the center.**

The cost and time required to process a log into veneer is much more than simply sawing it for lumber. Thus, buyers must be particular in what they accept as veneer quality logs. If the log does not meet expectations the log and manufacturing cost can easily exceed the value of the veneer.

The use of American black walnut for face veneer is a significant and high valued use for the species. There are several factors which affect the quality and thus value of walnut trees or veneer logs. Many of these factors are difficult to determine in standing trees and to determine value, buyers must depend on their previous experience in the immediate area as well as the condition and the history of the entire stand. Once a tree is cut the log ends can be observed and a much better evaluation can be made. Value will ultimately be determined by the buyer's judgment of the trees and market conditions at the time. Some companies will have individuals who specialize in standing timber and others who deal with cut logs.

First, any bark surface irregularities such as overgrown branch stubs, insect damage, old mechanical damage, etc., will likely disqualify the log as high valued potential veneer. It is generally assumed that no surface indicators of interior defects are present in the butt section of a quality veneer tree or log.

Veneer or logs should be straight and well rounded. Bow and crook in a log creates an aesthetic problem by causing the cathedral pattern in flat sliced veneer to run in and out of the sheet. Tension wood is frequently present in leaning trees and buckle can occur when the veneer is dried (Fig. 3). Logs which are not well rounded or have an off-center pith also result in veneer with less than desirable grain pattern and are also likely to result in buckle.

Growth rates and thus ring width should be uniform across the entire cross section of the



**Figure 3.**—Buckle in walnut veneer. Note the label.

log. Thus, thinning to encourage faster growth of potential veneer trees may not be desirable. Growth rates of six to nine rings per inch are usually acceptable. Fast growth or very slow growth rates are not preferred. The industry uses the word “texture” to define growth rate. Soft texture refers to a slow growth rate while hard texture refers to a fast growth rate.

Veneer quality trees should be healthy, well formed trees on good well-drained timber sites. A past history of grazing and or fire will reduce the quality and value of any potential veneer tree.

Most hardwood species grow over a wide geographic range. As such, climatic conditions, soil types, elevations, insect and disease potential, and other factors vary. Within the geographic range of each species there are certain specific areas where buyers feel the highest quality trees come from. Buyers will indicate that high quality trees can come from other regions as well but the probability is much reduced.

Color and uniformity of color in walnut veneer is an extremely important factor in determining value and it is a very difficult factor for the novice to judge. When trees are first cut or a fresh cut is made on the end of a log the heartwood should have a mint green color which changes to a uniform mousy brown color. Cooking schedules for walnut are extended over those of other species with the intent of darkening the color and the flitches are allowed to set several hours after slicing. This waiting period allows the mint green color to change to the preferred brown color before drying.

Uniformity of color is also critical (Figs. 2, 4). Like most other species, walnut can develop streaks of light and dark colors. The wood can also develop a dark splotchy appearance and this condition is sometimes referred to as “muddy”.

Bird peck, also called worm in the face veneer industry, is another very important defect in walnut (Fig. 5). Yellow-bellied sapsuckers probably cause most of the damage. It is generally believed that the bird pecks a hole to cause the flow of sap. Sap wet trees in the spring are easily spotted. Insects are attracted to the sap and the bird then feeds on the insects. The peck marks often circle the tree and birds tend to return to the same trees. If the cambium is penetrated, a small hole often with flagging will be found in the veneer. The peck mark is plugged or occluded with bark by the tree and after some time, it can become very difficult to spot. Like many smaller defects, once detected, the buyer will generally assume there are several more present which cannot be seen.





**Figure 4.— Two sample sheets from a walnut flitch showing numerous problems. Knots and irregular grain patterns are present throughout. The color is not uniform and the sapwood is excessive.**

Pin knots (Fig. 6 ) like bird peck can be hard to recognize in standing walnut trees, especially when only a few are present. These defects are the result of suppressed dormant buds which persist for many years as a bud trace or pin knot. As the name implies, the buds may not actually break through the bark, so in some instances they cannot be easily detected. Sometimes, due to a stimulus such as thinning and light, the bud may sprout. The sprout may develop into a small limb that often dies, but normally the bud trace continues to form. Pin knots are best observed on the end of the log after the tree is cut or where the bark has peeled loose and they appear as sharp spikes. On flat-sliced veneer, they appear as pin knots, but on quartered surfaces they appear as a streak or “spike” across the sheet of veneer. Purchasers of veneered panels will often specify no pin knots or limit the actual number of pin knots per square foot of veneer in the finished panels.

Fast growth trees also tend to have a wide sapwood zone (Fig. 7). The sapwood is the light colored wood to the outside of the darker heartwood. Sapwood is usually discarded in high quality walnut veneer. Deeply furrowed bark which is not patchy tends to be normal to faster growth and in some situations it may have a wide ring of sapwood. Figure 8 shows the bark on a normal growth and slow growth tree. Also, slow growth trees may not have the preferred color for walnut.



**Figure 5.— “Worm” or bird peck on the end of a walnut log.**

### FIGURED WOOD AND BURLS

Walnut tends to have “flash” or figure in the wood. Small amounts of figure are not desirable (Fig. 9) for commercial applications. End consumers tend to ask questions when one piece of furniture or paneling has some figure and the next piece does not. Also, office furniture is often bought in units and additional pieces purchased at a later date. For this application, it is particularly important that the grain and color characteristics be consistent.

On the other hand, intense figure in particularly large flitches can command a premium. Figure 10 shows an example of a heavy figured flitch which will produce a beautiful and unique end product. When the flitches are large the value increases because they can now be used as a matched and continuous pattern for paneling in large rooms.

Walnut burls are another unique item. Substantial burl wood was used for decorative Victorian walnut furniture manufactured from the 1870s to about 1900. These burls were taken from old growth American black walnut. Black walnut burls are essentially nonexistent today. Figure 11 shows an example of a sheet of veneer from a small one. Most of the walnut burls used today are taken from old California nut orchards where the English walnut is grafted onto the American walnut root stock and a burl develops. These burls are often sold by the pound and at least some of the veneer is used in the automobile industry.

Crowns and stump or root wood is also veneered for its figure. Large old growth walnut trees developed large swellings at the ground level. This material was also sliced into veneer and produced some very figured and decorative patterns. Figure 12 shows a sample of crown wood veneer produced in the 1940s.

Walnut typically has a large tap root and it too has been sliced for veneer because of the figure it produces.



**Figure 6.—Pin knots in walnut. (A)** shows an easily seen pin knot on a debarked surface of a log. These pin knots are hard or impossible to detect unless the bark is removed or the log is cut (B) from the tree. They will appear as a spot on flat sliced veneer (C) and as light streaks on a quartered surface (B).



**Figure 7.—Wide (left) and narrow sapwood on two walnut logs. Sapwood is considered a defect in walnut veneer.**





Figure 8.—Bark on normal and slow growth walnut trees.



Figure 9.—Slight flash or figure in walnut veneer. This level of figure is not desirable. Numerous pin knots can also be seen.



Figure 11.—Veneer from a low quality and small natural black walnut burl.



Figure 10.—Heavy and very desirable figure in a flitch of walnut veneer.



Figure 12.—Figured wood from a walnut stump.

## SUMMARY

Walnut is one of our most unique and valued species. In regards to planting, natural regeneration, growth characteristics and genetics, it is probably the most studied temperate hardwood species. Wood quality characteristics at least for veneer, are not generally well understood outside of the veneer industry. Only a limited number of walnut trees have the quality characteristics which command exceptional value. These characteristics need to be studied and better understood.

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