Computers 'n' Cutting Boards

Building an End Grain Cutting Board

Using a CAD Designed Field Pattern

A Presentation to the Northwest Woodworker's Guild

by

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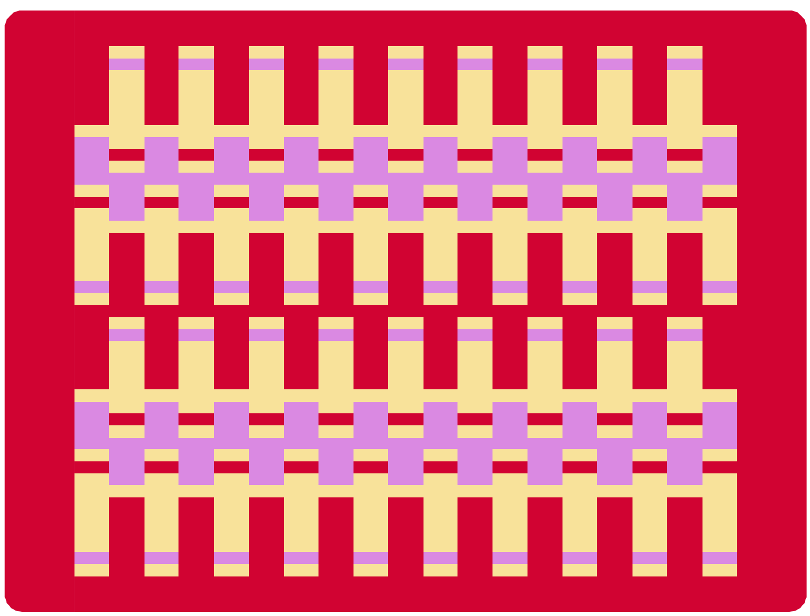

February 28, 2007

INTRODUCTION

An article appeared in the WOOD® Magazine, Issue 172, October 2006, describing a method for making a segmented, end grain wooden cutting board using various wood species, such as Maple, Cherry, and Walnut to obtain interesting geometric patterns, **Figure 1**.

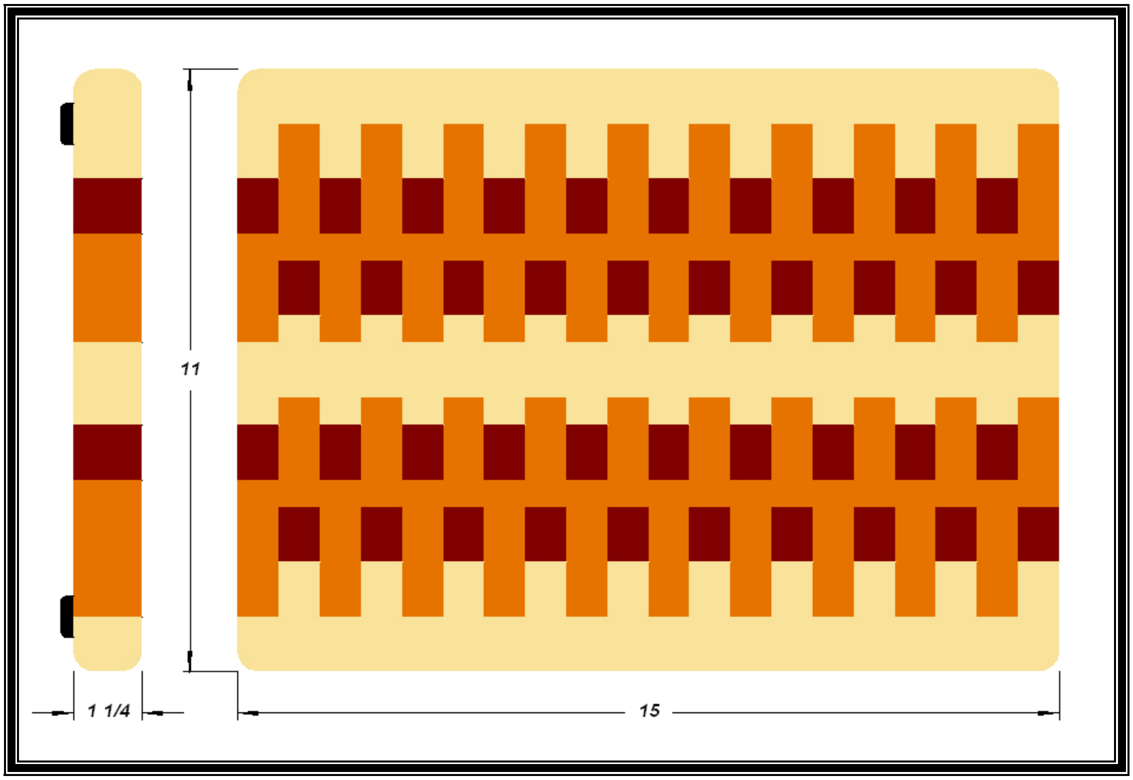

Figure 1 – WOOD® Magazine End Grain Cutting Board

I was impressed with the simplicity of fabrication of such a seemingly complex cutting board which showed off the various wood species and grain patterns. The key to the simplicity of the design lies in the fact that the cutting board is simply composed of strips cut from a single field panel, itself made of various width strips of different wood species. The geometric pattern is generated by rotating each strip cut from the field panel so that the end grain is vertical and flipping every other strip end for end and gluing the set of strips back together to form the cutting board panel.

This cutting board design was the basis for many of the cutting boards that a fairly large number of woodworkers have made, as evidenced by the number of photos displayed on some of the woodworking forum websites. It is easy to make, has a minimum number of pieces, and displays the various wood colors and grain patterns well. The beautiful cutting boards Herb Stoops brought to the last meeting were variations of this basic design.

I was so fascinated by the simplicity of fabrication and the limitless design possibilities for the field pattern that I decided to make an end grain cutting board for each of my four kids for Christmas 2006 – but it looks like they will be a little late………………… The boards may have slightly different field patterns, but all will be made from Ash, Bloodwood, and Purpleheart.

And of course, all of you realize by now, that one just ***never*** makes a project like it is shown in a magazine article – one simply ***has*** to customize it to make it "better"…………….and of course we rationalize this by convincing ourselves that we must have a bigger challenge, since this mountain has already been climbed!

After making and analyzing a CAD drawing of this design, I decided that I could customize the field pattern to give the cutting board a more unique appearance by altering the size and position of the segments. Subsequently, I found that by using some of the simple tools in my CAD (Computer Aided Design) program, I could quickly develop a new field pattern and make a visual representation of the board. So I made a large number of field patterns and selected some of them for fabrication of actual cutting boards. Photos of these boards will appear later in this presentation – and maybe the boards themselves, if I don't get them delivered ……………

This presentation is intended to illustrate a simple use of a CAD program to design the field pattern for an end grain cutting board, and provide the basic fabrication information for the fabrication of such a cutting board.

DESIGN DECISIONS

Choice of Woods

Many species of hardwoods are suitable for end grain cutting boards, with Hard Maple, Ash, and Cherry being commonly found in commercial as well as home built cutting boards. However, many other hardwoods such as Ash, Bloodwood, Paduak, Purpleheart, Zebra Wood, Walnut, Wenge, etc. have also been used successfully. I wanted to use three species of wood having a combination of beauty, hardness, color contrast, dimensional stability, and availability. Having viewed a number of cutting boards made by professional woodworkers and home hobbyists from a large number of different species of woods, I narrowed my choices to Ash, Bloodwood (Satine), and Purpleheart. Using information available on the internet, I compared the coefficient of expansion for each of the three species and found them to be very similar. Due to the small size of the individual segments in an end grain cutting board, expansion is probably not an issue, but to be safe I wanted the selected woods to have similar characteristics.

Design Features

- **Size**

  I felt like the original WOOD® Magazine cutting board size was a little too small. I decided that the finished cutting board should be approximately 1 ½ inches thick x 12 – 13 inches wide x at least 16 inches long. This seemed to be somewhat of an intermediate size compared to those available commercially.

- **Shape**

    Various shaped cutting boards are available, but I decided upon a rectangular shape with 3/8 inch radiused corners. I also wanted the board to have a cove undercut on the ends or all around to allow a serving dish to be tucked under the edge of the board to allow the cut materials to be swept off onto the dish. This feature also provides a finger grip for carrying the cutting board.

- **Field Patten**

    I felt like the typical WOOD® Magazine field pattern could be improved and made more interesting by introducing various size segments, with some of them small enough to be color accents to set off a contrast with adjoining segments. I wanted to develop unique field patterns that would show off the various colors and grain patterns of the chosen wood species. Where I wanted a more formal look I decided that the ends and edges of the board should be made of the same dark wood species, and that each end border should be made from two segmented strips of the same species to give the appearance of a handle on each end of the board. In addition, I wanted a minimum overlap of ¼ inch between any two adjacent segments, as opposed to a chess board appearance in which the corners of the adjacent segments intersect, such that all of the joints are inline in one or both directions.

- **Feet**

    As in the WOOD® Magazine design, I elected to use four low profile rubber or plastic feet to raise the cutting board off a countertop and provide a non-skid base.

<u>Desired Cutting Board Configuration</u>

Because of the way the cutting board is designed and fabricated, the ***thickness*** of the material used for the basic field panel determines the ***width*** of each one of the segmented strips that make up the field of the cutting board. In this case, that thickness will be ¾ inch. Choosing a size to fit my planer and drum sander, I decided that the board was to be about 12 1/2 inches wide and have a length of approximately 17 inches. Since the cutting board is made from strips cut from the ¾ inch thick field panel, the **Basic Strip** from which the entire board field will be built is ¾ inch wide x 12 ½ inches long, made of varying width segments of different wood species to create the unique geometric pattern.

Figure 2 is a CAD drawing of the end grain cutting board described above. The actual finished size of the board may vary from the drawing due to material size variations and fabrication tolerances.

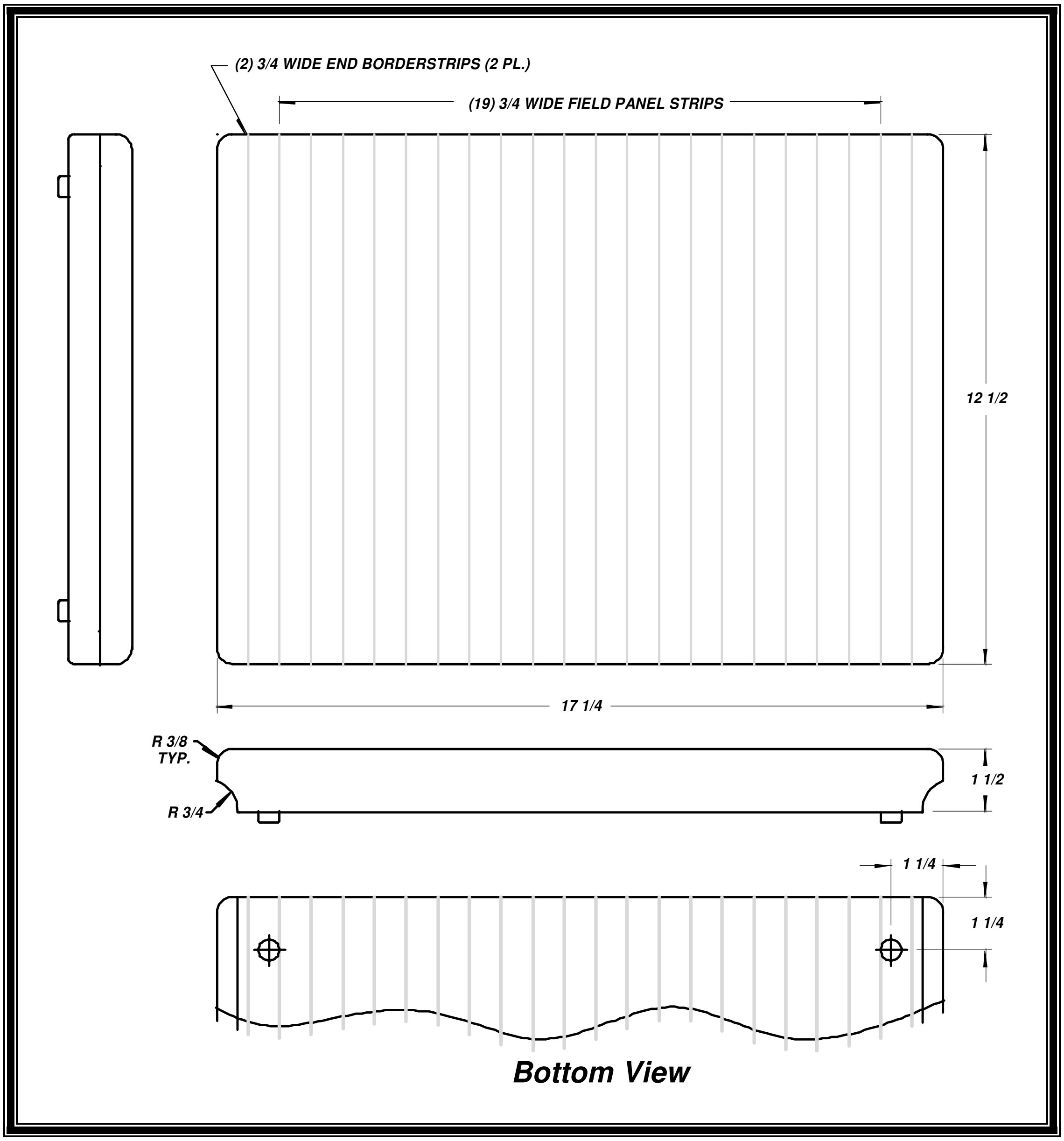

Figure 2 – End Grain Cutting Board Design

FIELD PATTERN DEVELOPMENT WITH A CAD PROGRAM

While the field pattern for the cutting board could be drawn with a tee square and triangle, or by the use of grid paper, this application lends itself ideally to the use of a CAD program. This is especially true if you wish to explore many different field patterns, since they can easily be developed, saved, altered, and used as starting points for new designs. Different colors can also be used to simulate different wood species. The design possibilities are almost limitless.

Many CAD programs could be used for this project. I happen to prefer the DesignCAD® series of software products. I find them very intuitive and easy to use. The one I currently use is a 2D/3D CAD program called **DesignCAD 3D Max, v15 ®**, marketed by IMSI, Novato, CA. This program, which I purchased on

Ebay®, contains many more tools and features than needed for this simple design task. This DesignCAD program and earlier or similar versions are frequently available on Ebay® for $15 or less. Many other hobbyist type programs, like TurboCAD ®, IntelliCAD ®, etc. and even high powered commercial design programs like AutoCAD® could be used. There are also freeware CAD programs available on the internet that may be suitable. Also some painting or graphic design programs may also contain the simple tools necessary for this design task.

<u>Making a Grid to Draw On</u>

Almost all CAD programs, from the simplest to the most complex have a very handy design feature in which you can produce a square grid on the computer screen that has any dimension for the individual squares that you wish to choose. In the pre-computer era, you probably remember the Engineering pads and Quadrille pads which had a printed grid on the paper to aid design layout. For our application, since we will be using typically wood materials that are a nominal ¾ inch thickness, a ¼ inch grid is very useful, since a ¾ inch thick piece would be three grid squares wide, a ½ inch piece, two squares wide, etc.

Figure 3 shows a blank 1/4 inch square grid on the computer screen.

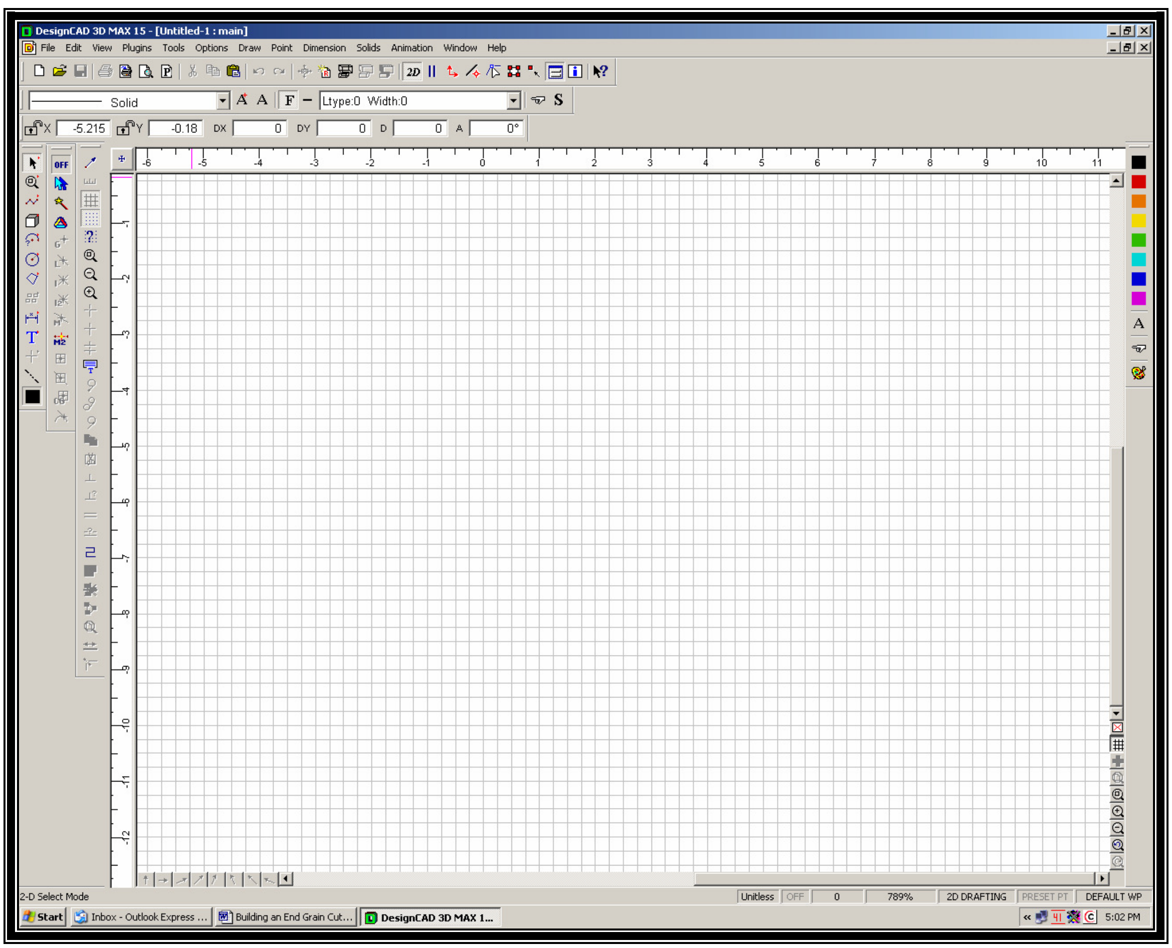

Figure 3 – Blank ¼ Inch Square Drawing Grid

Making a Toolbox

Just as we select hand and power tools to suit the woodworking task we are going to do, CAD programs allow you to use tools from standard tool boxes or toolbars and build custom tool boxes for specific applications. I have chosen ten tools to put in a special tool box for designing cutting board field patterns, as shown in the upper toolbox in **Figure 4.** The lower toolbox is the **Color Toolbox** which allows me to select various colors to apply to my design.

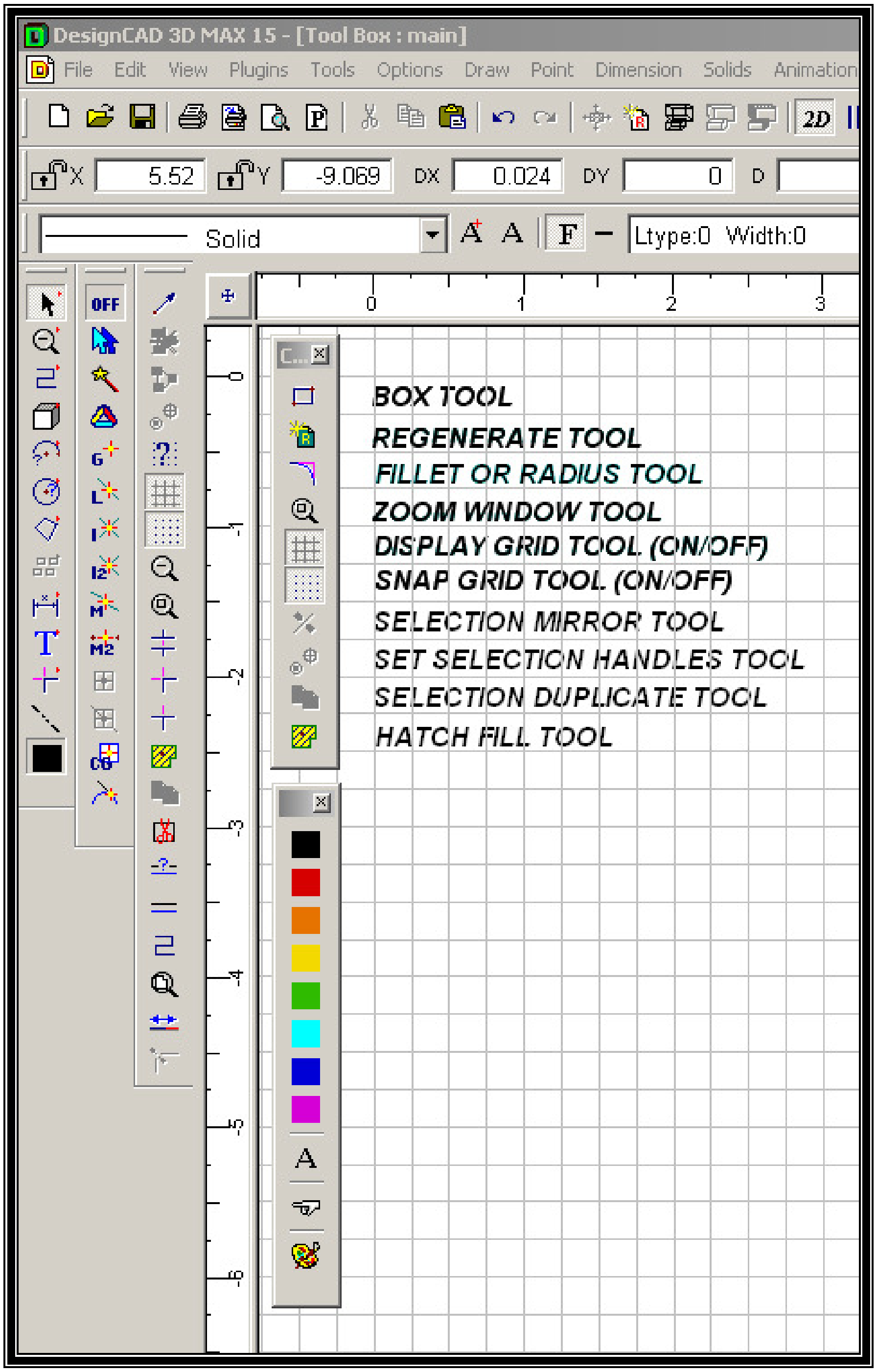

Figure 4 – Special Tool Box for Designing Field Patterns

Some of the names of the tools in our toolbox are somewhat self explanatory. However, a couple of these tools merit a little discussion to help understand their function. Other CAD programs may identify similar tools by different names.

Set Selection Handles Tool

This tool allows you to attach a **Handle** to a **Selected** object so that the object can be moved with the cursor to a place on the drawing. There are several choices you can select for the location of the **Selection Handle**. I have chosen the **Upper Left** option. The **Selection Handle** will be applied to the **Upper Left** corner of the **Selected Object** by clicking the mouse anywhere in the grid.

Snap Grid Tool

When this tool is active, you may only place the **Selection Handle** of a **Selected** object on an intersection on the grid pattern. It is useful to set the **Snap Grid Size** and the **Display Grid Size** to the same setting, ¼ inch in this case.

Selection Mirror Tool

This tool allows you to make a mirror image of a **Selected** object without having to redraw it. I have chosen to **Mirror Normal to the Y Axis** – this will flip the image end for end. This will move the **Selection Handle** from the **Upper Left** corner to the **Lower Left** corner of the **Inverted Selected Object** We will use it to create the **Inverted Strip** from the **Basic Strip** for use in our cutting board field pattern.

Selection Duplicate Tool

This tool allows us to create a duplicate image of a **Selected** object. Double clicking on this tool will cause a duplicate image to be placed on the screen wherever the cursor is positioned each time the mouse is clicked. This tool allows us to quickly create our field pattern from the **Basic** and **Inverted Strips**. By first placing a **Selection Handle** on the corner of the **Basic Strip** or the **Inverted Strip**, and double clicking the mouse, we can duplicate them and place a series of them on the proper places on the grid to form the field pattern.

Figure 5 illustrates **Selecting** an object and placing it on the grid. **Figure 6** illustrates creating a **Mirror Image** of a **Selected** object and placing its **Selection Handle** on the grid.

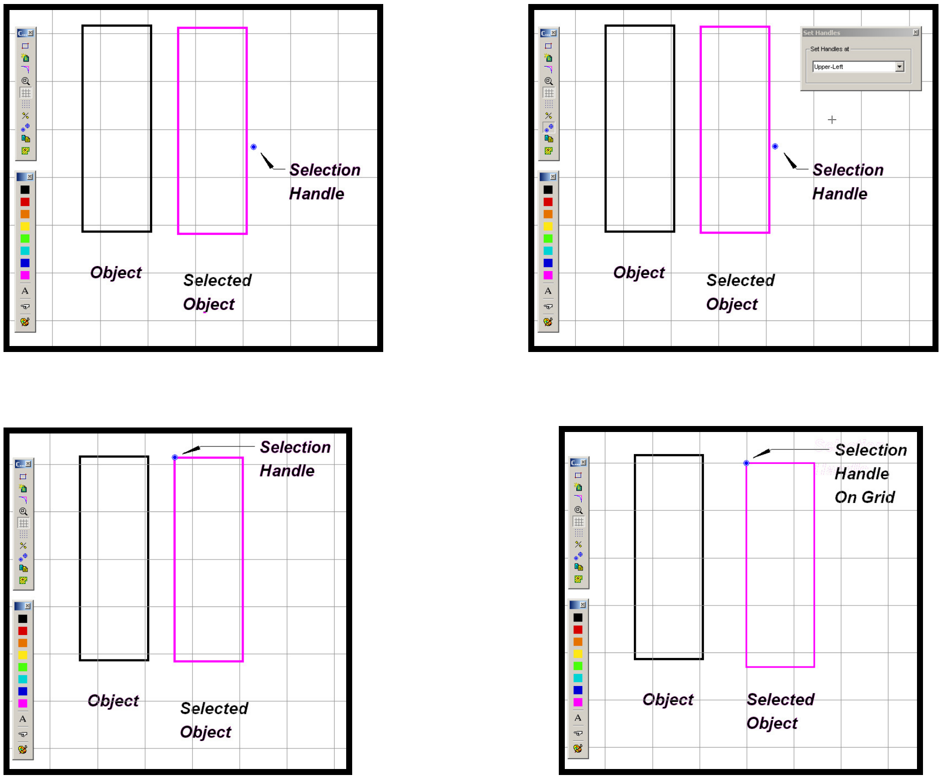

Figure 5 – Selecting and Placing an Object on the Grid

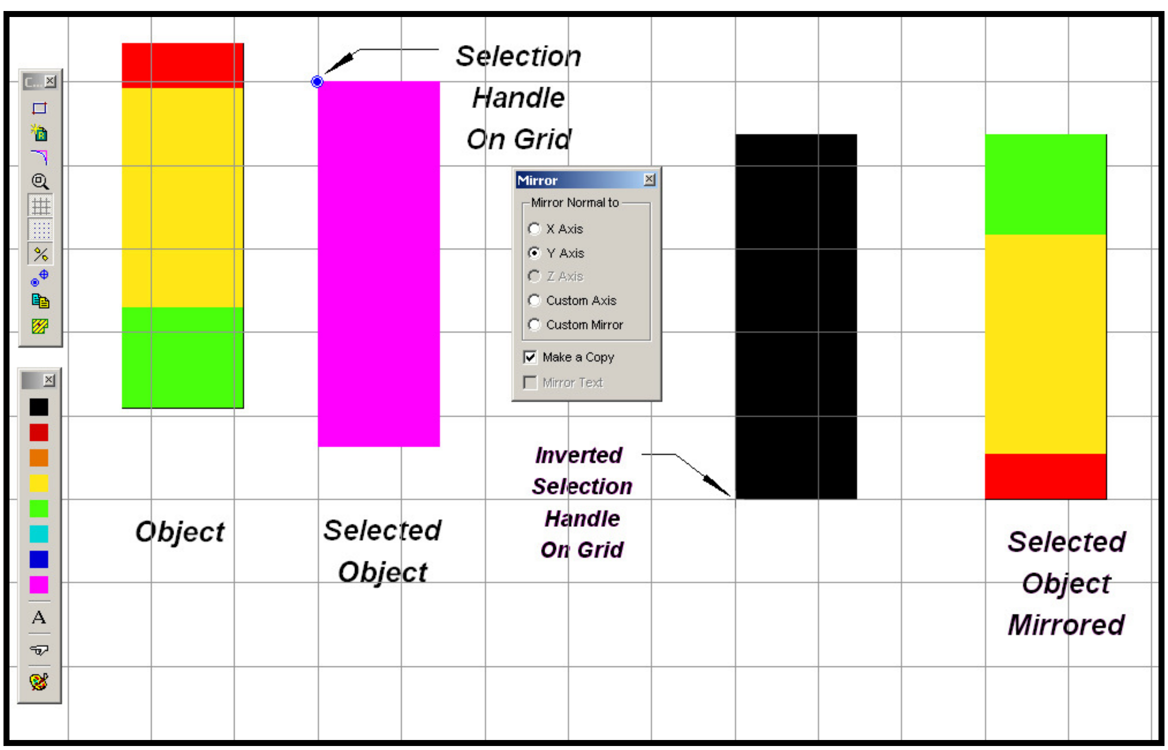

Figure 6 – Mirroring a Selected Object

Making a Set of Basic Building Blocks

In order to easily create new field patterns, it seemed logical to create a set of ¾ inch wide basic building blocks in ¼ inch long increments that can be duplicated and pasted onto our **Basic Strip**. Using the **Box Tool** and the **Hatch Fill Tool** in the special tool box, I created a set of these blocks in each of the three simulated wood species colors for Ash, Bloodwood, and Purpleheart, **Figure 7**.

In addition to the **Basic Strip** box, I also created the outline shapes for the right and left hand double width border strips. They will be filled with the appropriate color later.

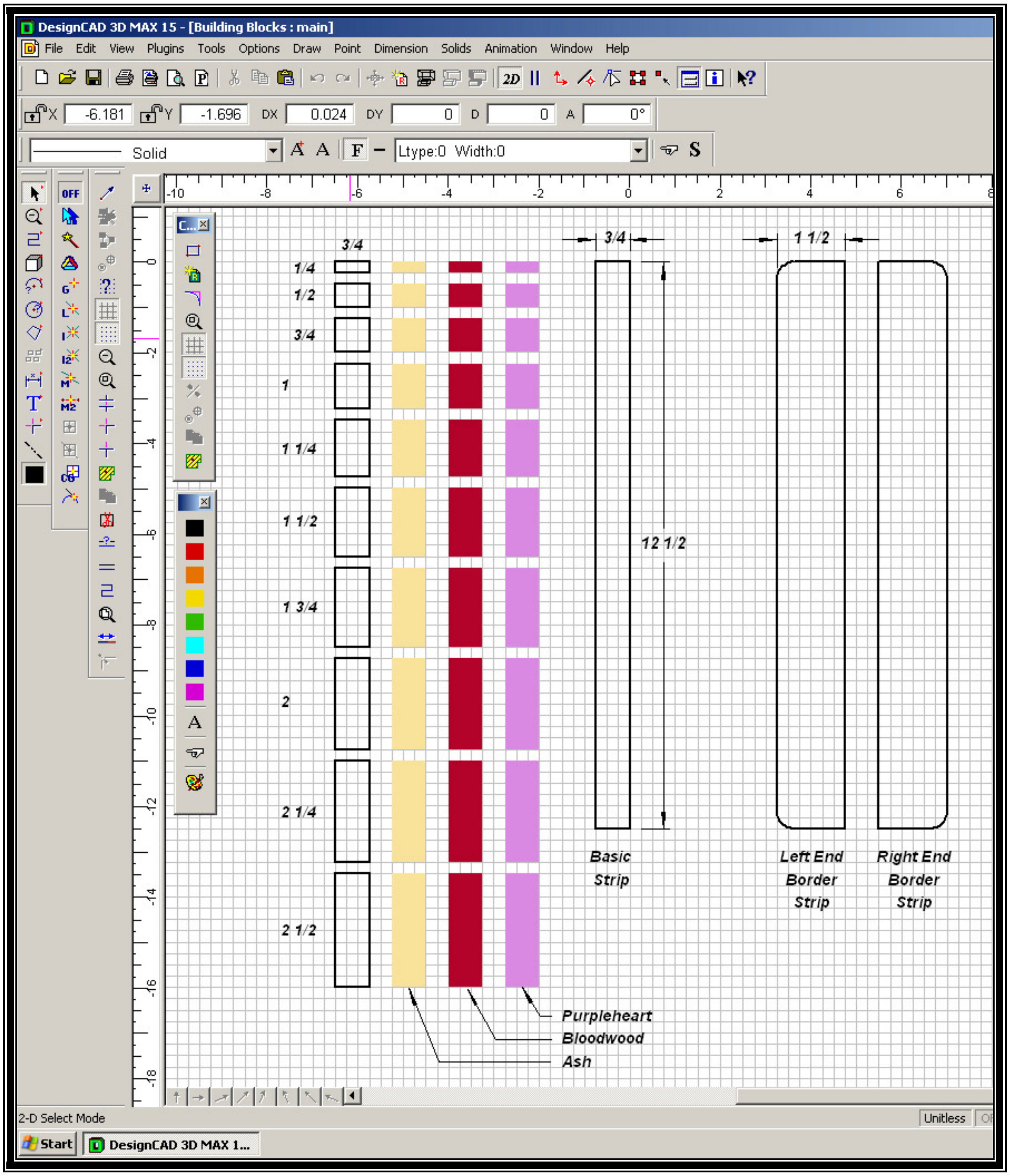

Figure 7 – Basic Field Strip Building Blocks

Developing a Field Pattern

As discussed earlier, an end grain cutting board is created by fabricating a field panel composed of strips of the selected wood species and cutting this panel into strips crosswise, rotating them so the end grain is vertical and gluing them back together to form the cutting board panel. The cutting board field panel pattern is generated by flipping every other field panel strip end for end before assembling into the cutting board panel.

The geometric pattern of the cutting board is determined by the size, color, and arrangement of the individual strips which made up the original field panel. Interestingly enough, switching dark woods with light woods and vice versa while using the same geometric pattern makes the cutting board looks totally different, as though a different pattern had been used. The possibilities are almost limitless.

But using a CAD program to create the virtual field strips and assemble them into a virtual cutting board on the computer is not only fun, but it is a very fast method of creating multiple versions of the cutting board using various patterns, without having made any sawdust or wasted any expensive hardwood.

Essentially, we are going to create a **Basic Strip** with the CAD program and a companion **Inverted Strip** and arrange them into a cutting board panel on the computer screen. So let’s try out our artistic abilities and create a field pattern and see what it would look like on a finished size cutting board.

Creating the Initial Basic Field Strip

Using our **Basic Strip** outline, we will place some colored blocks along its length. From experience, I decided that there would be three lines of symmetry – the centerline of the strip, and two additional lines parallel to it and 2 ¾ inch away from the centerline on each side. Narrow Ash segments are used to separate the dark colored woods. Once we have created the **Basic Strip**, we will create an **Inverted Strip** by flipping the **Basic Strip** end for end. These will be the first two field strips in our cutting board field pattern. We will also fill the end border strip outlines with the Bloodwood color, **Figure 8**.

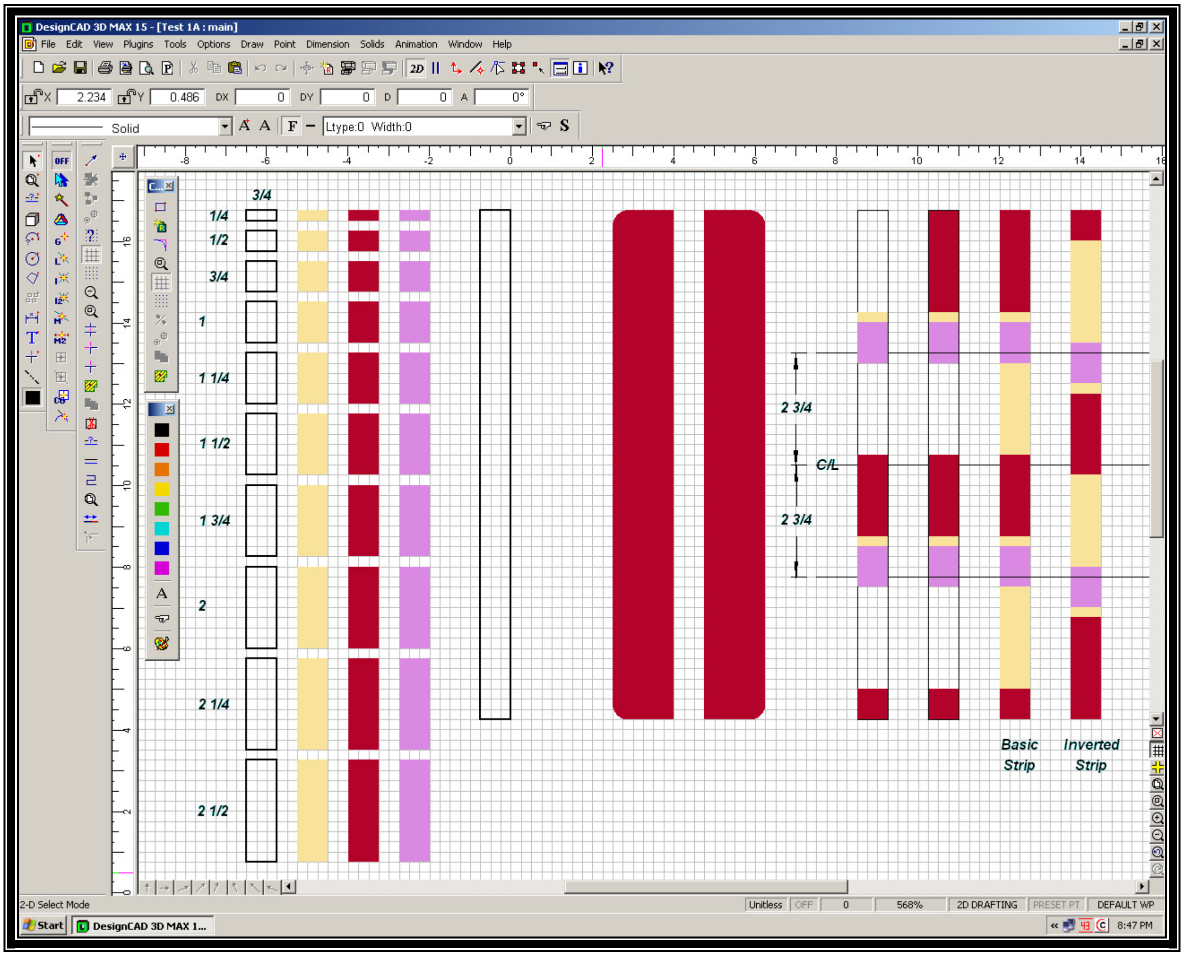

Figure 8 – Creating the Initial Basic Field Strip

After creating the **Basic** and **Inverted** field strips, we will use them, along with the two end border strips, to create an initial cutting board field pattern, **Figure 7**. The upper partially completed pattern is formed by selecting a **Basic Strip**, attaching a **Selection Handle** to its upper left corner and **duplicating** it ten times in the field pattern, allowing ¾ inch between strips. The end border strips are added in a similar fashion. To complete the cutting board pattern, the **Inverted Strip** is **Selected**, **Duplicated** with a **Selection Handle**, and installed in the vacant field spaces.

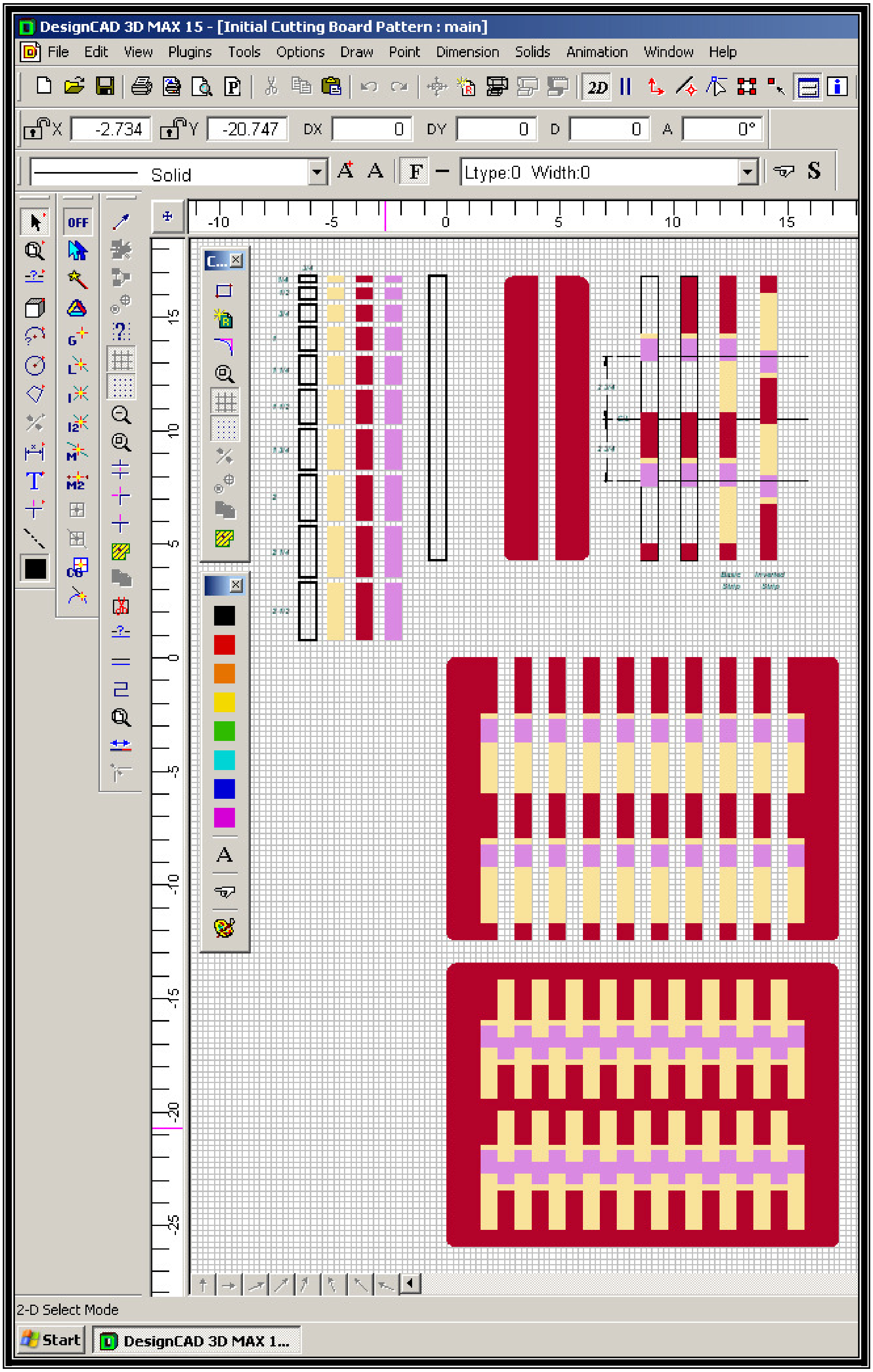

Figure 9 – Creating the Initial Cutting Board Field Pattern

Creating A Second Basic Field Strip

Although the initial field pattern will produce a nice looking cutting board, I chose to alter the design slightly to reduce the overlap in the Purpleheart and center Bloodwood segments to ¼ inch. This change is made by altering the size and position of those segments in the **Basic** and **Inverted** field strip. The easy way to make this change is to duplicate the original **Basic Strip** configuration as a starting point for the revised configuration.

Note that I moved the upper and lower Purpleheart segments **1/8 inch upward** and added a Bloodwood segment **¼ inch shorter** than the original segment and **positioned it 1/8" above the strip centerline**. In order to do this, I had to change my **Snap Grid Size** setting from 0.25 to 0.125. None of my standard color blocks fit so I filled the blank areas with the appropriate colors using the **Hatch Fill Tool**.

Note that the new **Inverted Strip 2** will produce ¼ inch overlaps between the center Bloodwood segments and both of the Purpleheart segments. This should produce the desired cutting board field pattern.

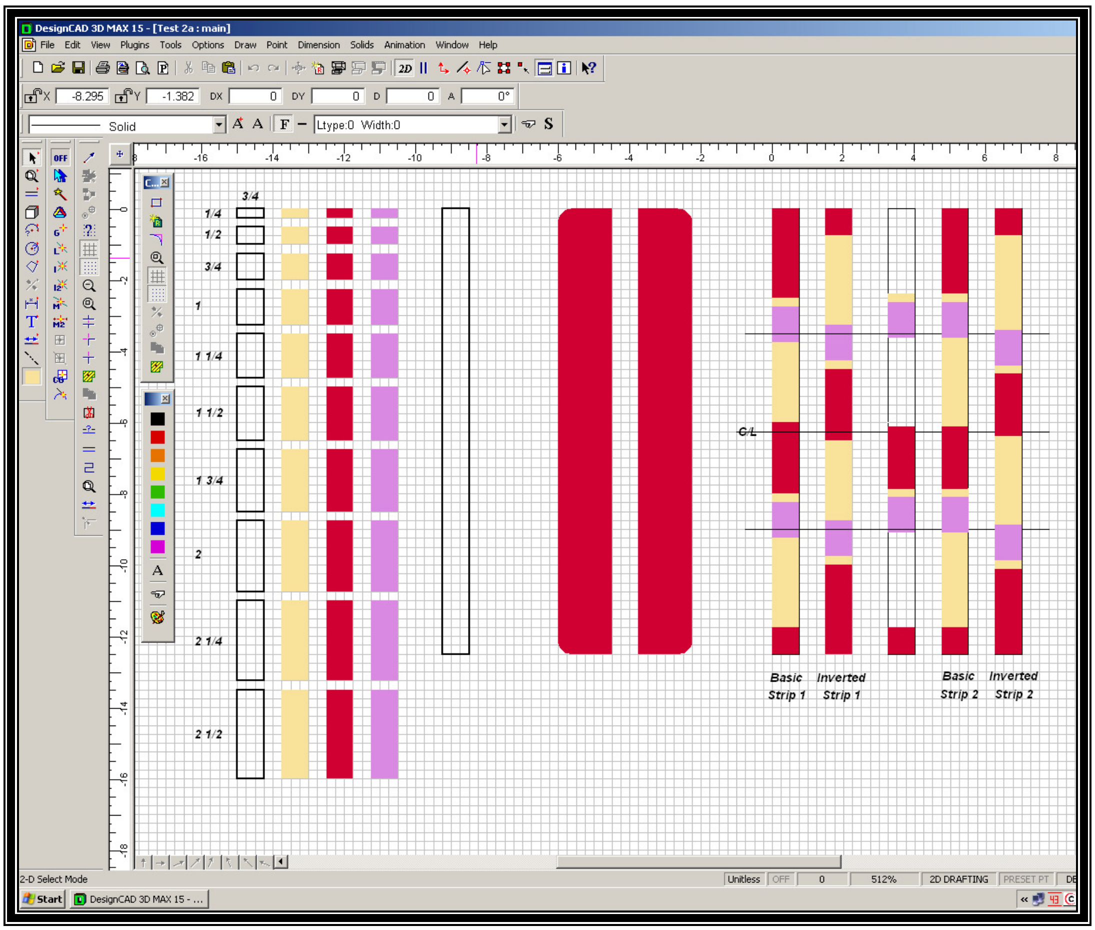

Figure 10 – Creating the Second Field Strips

Using the same end border strips and the new **Basic Strip 2** and **Inverted Strip 2**, we can create a second cutting board field pattern, **Figure 11**.

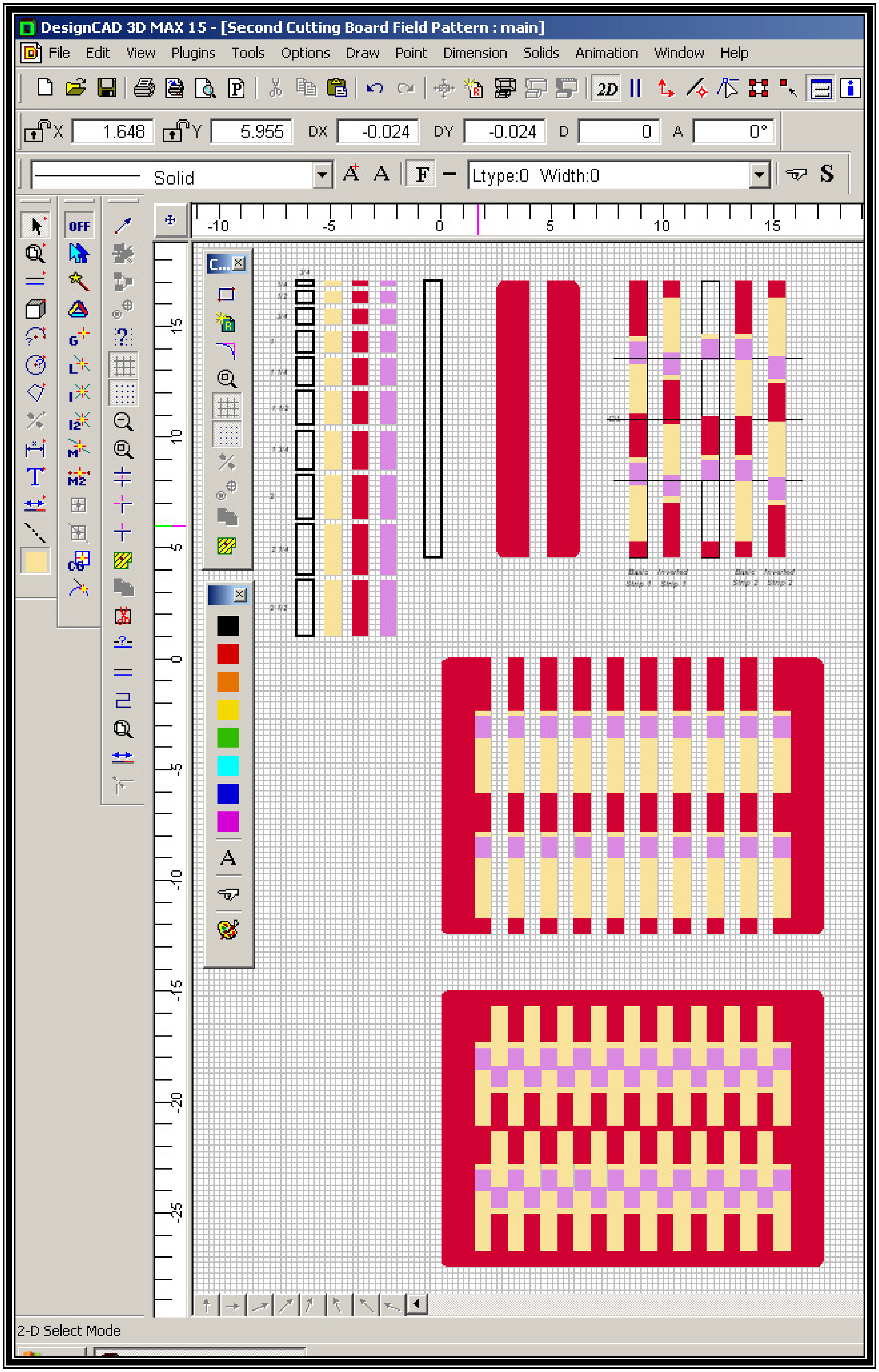

Figure 11 – Creating the Second Cutting Board Field Pattern

Although this cutting board field pattern meets the minimum ¼ inch overlap of adjacent segments, it somehow seems a little plain. I think if we added some small color accents to break up the large solid color bars, we would have a much more interesting pattern which would enhance the different wood colors and grain patterns.

Starting with the previous strip configuration I added two ¼ inch wide colored accent segments to break up each of the long Ash segments, creating the **Final Basic Strip**, **Figure 12**.

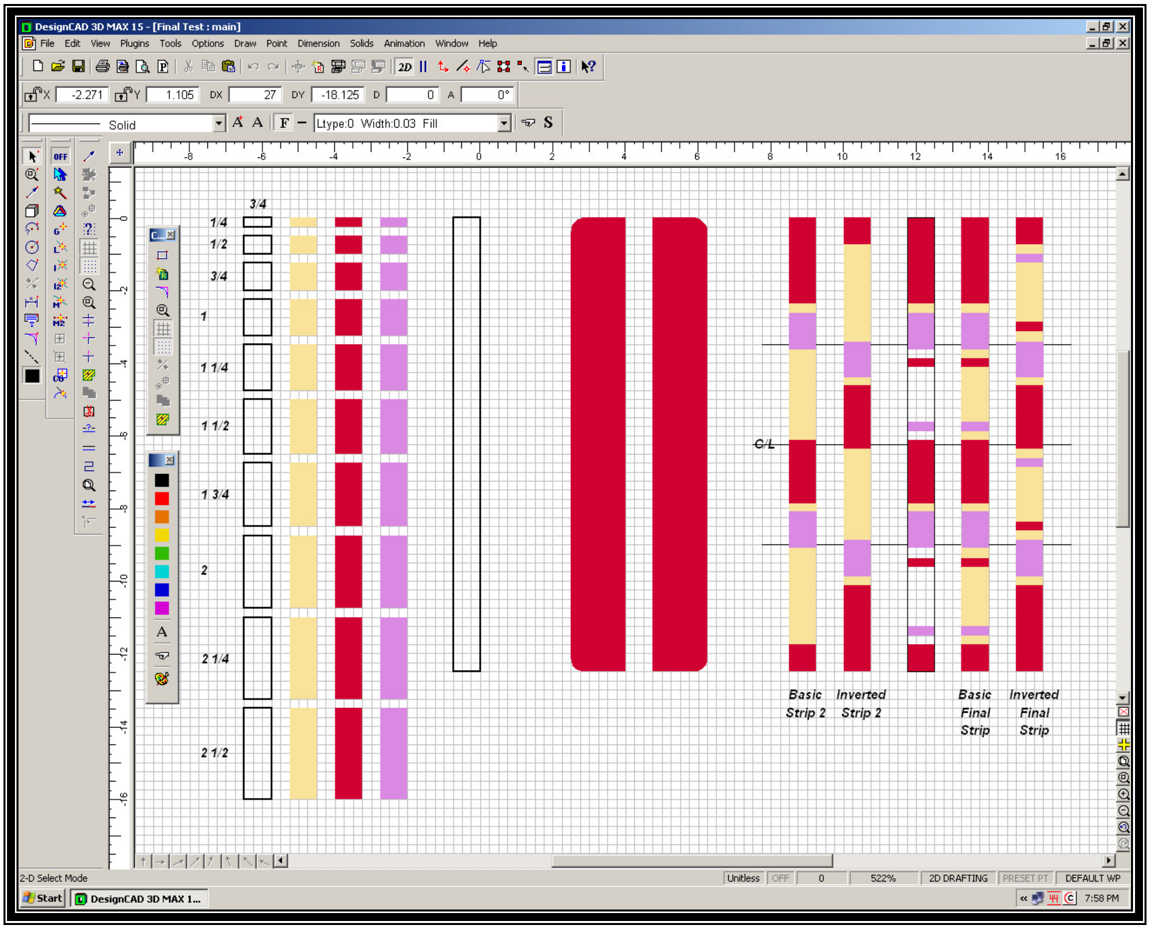

Figure 12 – Creating the Final Field Strips

Using the new **Final Basic Strip** and **Final Inverted Strip** we can create a Final Cutting Board Pattern, **Figure 13**.

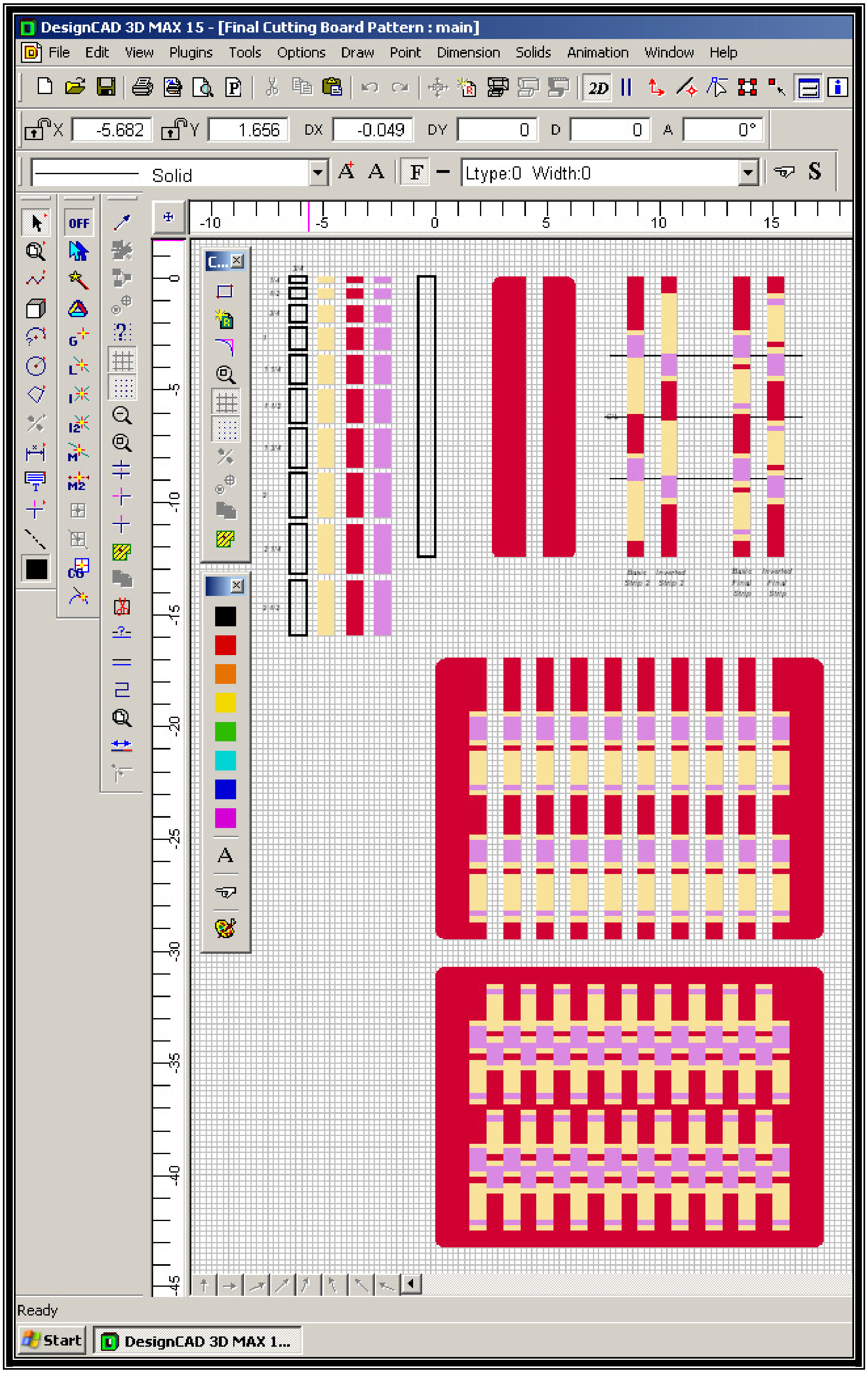

Figure 13 – Creating the Final Cutting Board Pattern

Figure 14 shows the final cutting board pattern with the **Basic Strip** dimensioned to indicate the various wood species segment widths. This will be used to determine the amount of wood required for the project.

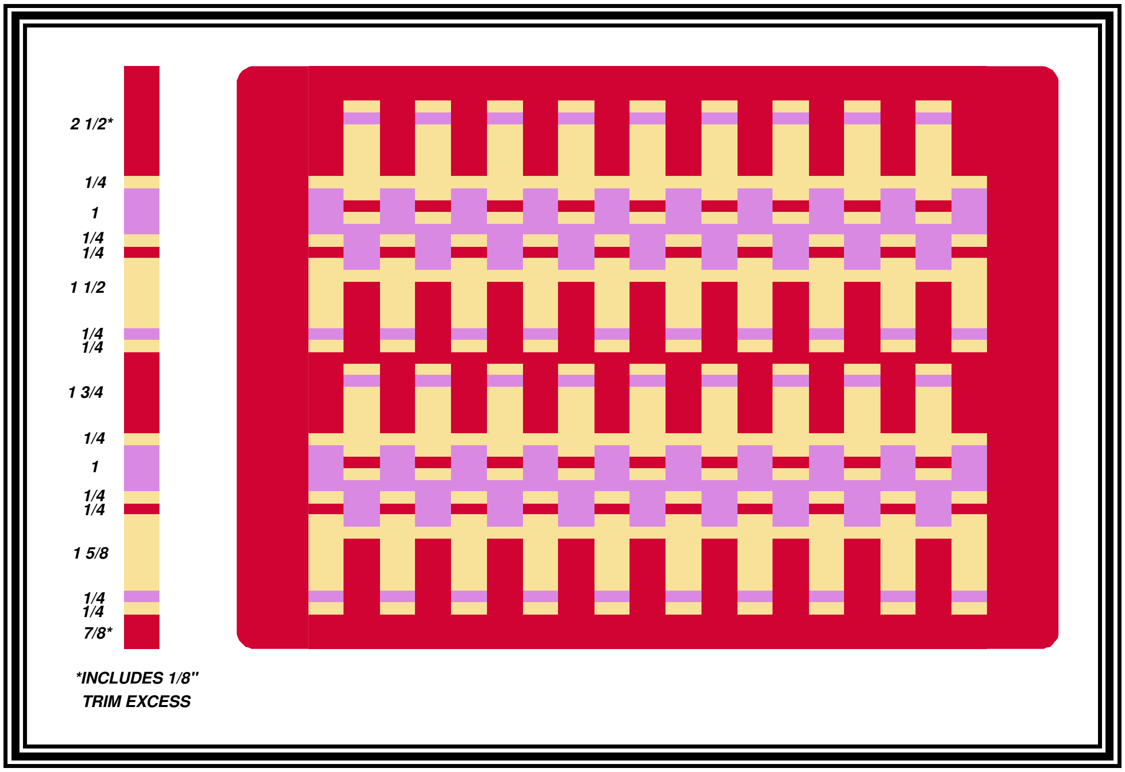

Figure 14 – Final Cutting Board Pattern and Basic Field Strip

BUILDING THE CUTTING BOARD

Wood Selection

As determined earlier, this board will be fabricated using Ash, Bloodwood, and Purpleheart. Although the wood used for a particular cutting board could be selected from available shop stock, cutoffs, scrap from previous projects, etc. with great success, there will probably be a wide variation in appearance of different pieces of the same species. In this project, I wanted to make a cutting board with a more formal, uniform appearance. Therefore I decided to make all of the individual pieces of each species from a single board, if possible. And, to provide greater uniformity of appearance of the wood grain pattern, each piece of the same species in the pattern was cut sequentially from the board as it would appear in the pattern. In addition, as much as possible, the grain pattern of the individual pieces was oriented in the same direction. This is certainly not necessary, but was just a personal preference to produce a more formal, uniform appearance of the finished board.

Material Requirements

The size and thickness of the cutting board and the final thickness of the material determine the total amount of lumber that must be used. And obviously the field pattern to be used determines the amount of material required for each species. From the drawing of the cutting board, we note that it will take 19 field strips and four end border strips to build the board. Each of the1 5/8” wide strips will be cut from the ¾” thick field panel. Using the segment dimensions shown for the **Final Basic Strip** from our CAD developed pattern, **Figure 14**, we can determine the amount of material and create a check off cut list of each species, **Figure 15**. The minimum length of the strips to make the field panel will be 35” (20 x 1 5/8 + 20 kerfs, includes a spare strip). However, I would recommend making the panel at least 40 inches long to allow for removal of snipe, end checking, end trim, etc. The minimum length of the end border strips will be 7” (4 x 1 5/8 + 4 kerfs). I would recommend making the panel about 11 inches long for the reason stated above.

ASH		**BLOODWOOD**		**PURPLEHEART**	
Field Strips		**Field Strips**		**Field Strips**	
Width	Check Off	Width	Check Off	Width	Check Off
¼		2 ½		1	
¼		¼		¼	
1 ½		1 ¾		1	
¼		¼		¼	
¼		7/8			
¼		5/8	(5) Kerfs		
1 5/8		3/8	Jointing		
¼		**Total Stock = 6 5/8” X 40”**			
		End Border Strips			
		1 3/8			
		2			
		1 ½			
		2			
		1 ¾			
		1 ¾			
		2 3/8			
3/8	Jointing	3/8	Jointing	¼	Jointing
1	(8) Kerfs	7/8	(7) Kerfs	½	(4) Kerfs
Total Stock = 5” X 40”		**Total Stock = 14” X 11”**		**Total Stock = 3 ¼” X 40”**	

Figure 15 – Cutlist Table

For this project, I was able to find 4/4 stock long enough to make all of the strips of a given species from the same board. Because this cutting board was one of five that I was making, I had to compromise the length of the field strips such that they were cut to net length of 30 ½ inches, eliminating any allowance for removal of potential planer snipe and end check areas – a decision I was to later regret.

Prior to ripping into strips, each of the boards was thickness planed to the approximate thickness of the thinnest one. Unfortunately, most of the boards exhibited planer snipe in the last 2 inches or so, after this operation. Therefore, since these were net length boards, I drum sanded the boards with a 120 grit belt to a common thickness that would remove the snipe on all of them. This problem could have been avoided by providing enough excess material to simply remove the snipe areas. As a result, the boards finish sanded to a thickness of approximately 0.65” -- less than my design dimension of ¾”. Unfortunately, the loss of thickness translated into a shorter final cutting board length, which will be discussed later.

The field strips of each species were ripped from the same board in the order they would be installed in the field panel – not a requirement, but a personal preference to produce greater uniformity of appearance in the finished cutting board. The field panel strips are shown in **Figure 16**. And no, the strips are not tapered, just touching at the far end of the photo.

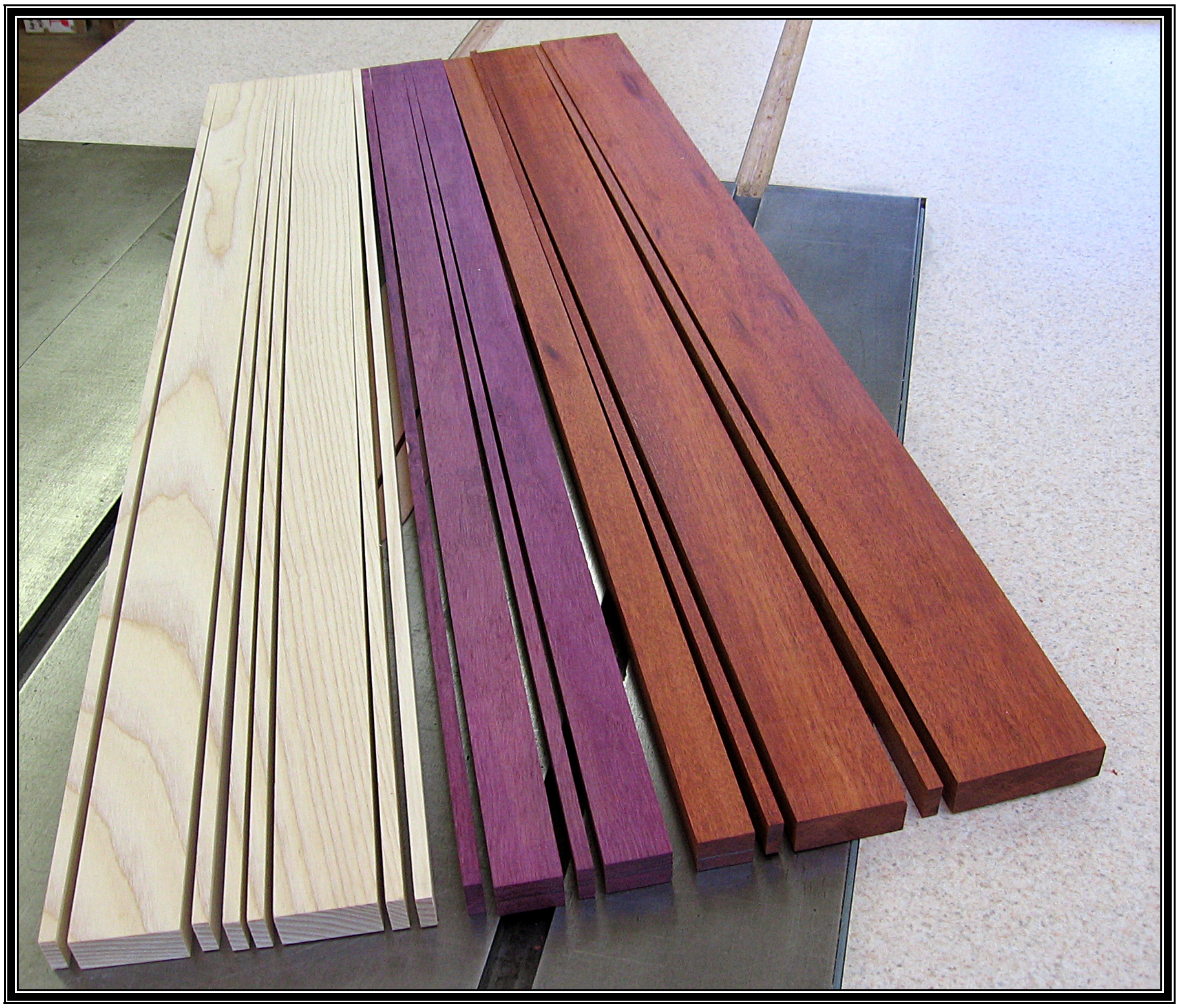

Figure 16 – Field Panel Strips

Then the field strips were arranged in the order shown on our **Basic Strip** to form a dry fit field panel, as shown in **Figure 17**.

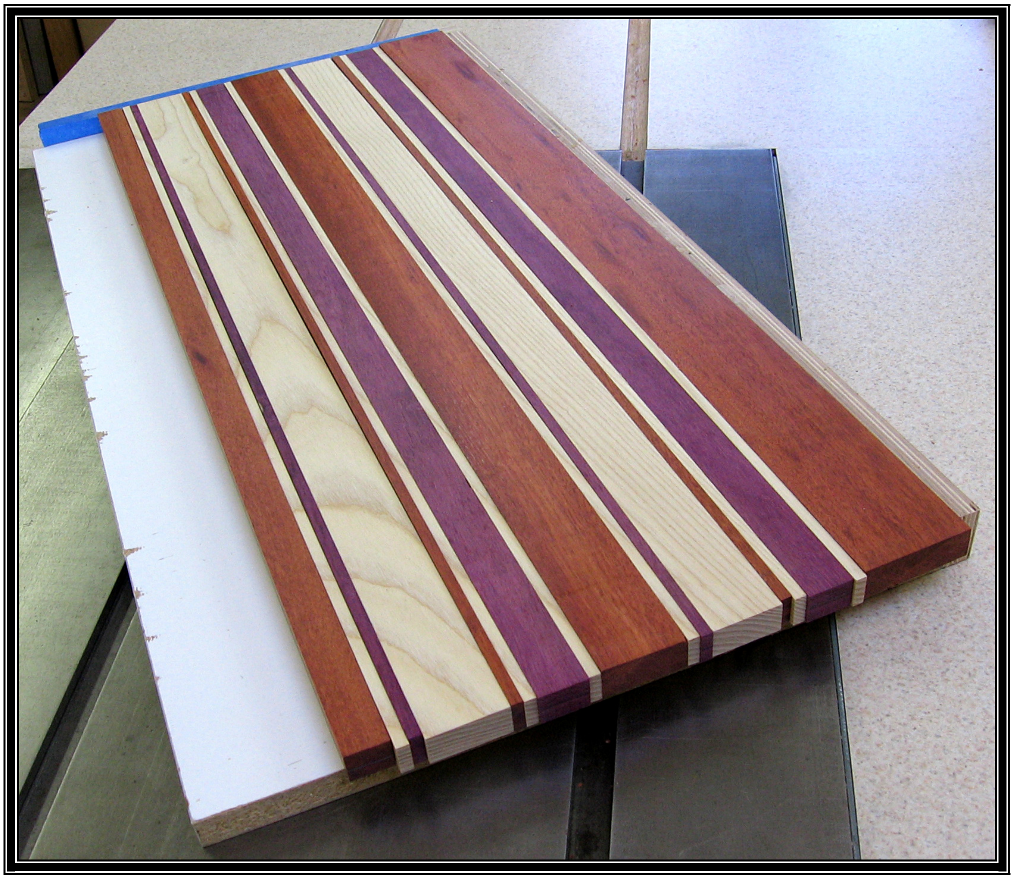

Figure 17– Field Panel Strips Arranged in Required Order

The dimensions of the field panel in large part determine the size of the finished cutting board. The ***length*** of the field panel establishes the maximum number of strips available for the cutting board, which in turn establish the ***thickness*** of the cutting board. The ***thickness*** of the field panel determines the ***length*** of the cutting board. The ***width*** of the field panel will be the finished width of the cutting board less excess for final trimming. One of the surprising things about end grain cutting boards is that ***small differences*** in dimensions of the material used to make the field panel can make ***large differences*** in the finished dimensions of the cutting board. For instance, a 1/16" loss of thickness in the field panel will <u>reduce the length of the cutting board by more than 1 inch</u>! Therefore, it is very important take whatever measures are necessary to preserve the ***thickness*** of the field panel through its fabrication operations and final sanding after glue up.

<u>Assembly Jigs</u>

Recognizing this situation, I decided to try to minimize the surface mismatch between adjacent strips making up the field panel. To that end, I built a simple assembly jig from a piece of melamine shelving material with end stops on two edges, as shown in **Figure 17**. The melamine facing provides a smooth, nonstick surface for gluing, and a flat reference surface to push all of the field panel strips against to minimize mismatch. The end stops, which were covered with a strip of painter's tape, provide two perpendicular surfaces to index one end and one side of the field panel to square up the panel. I made two of these assembly jigs from the piece of shelving – a longer one for assembling the field panel and end border panel, and a shorter one for assembling the cutting board panel. Both of these jigs worked very well and were a great help in maintaining alignment and minimizing surface mismatch. The jig also helps corral the slippery glue-coated strips when assembling for gluing. For a more durable nonstick jig, apply a laminate surface.

Surface Mismatch

The issue of mismatch between adjacent strips is a very important one and worthy of special attention. Mismatch is important because the ***net*** effect of the mismatch between strips which are cut from the same thickness material is ***doubled*** because it appears on ***both*** sides of the panel. If one strip is ***higher*** than the adjacent one on the top surface of the panel, it will be that much ***lower*** on the opposite side of the panel. Therefore, in the final sanding operation after glue up, the mismatch will have to be removed from ***both*** sides of the panel, ***reducing its thickness***, and more importantly ***reducing the length of the final cutting board.***

In order to address the mismatch condition, I used multiple cauls crosswise of the panel, C-clamped between the panel and the bottom of the jig. This method pushed the strips against the flat, smooth melamine surface of the jig base quite well and did significantly minimize mismatch. In fact, this method worked so well, that on some of the panels, the excess glue between the strips spread out in a uniform layer on the bottom of the panel. When applying the cauls, it is necessary to alternately loosen the panel clamps and the caul clamps to allow the strips to position themselves against one another and against the jig face.

Glue Choices

Several suitable glues are commonly available which are satisfactory for end grain cutting board fabrication. They include such products as Titebond II® and Titebond III® and polyurethane glues. I selected Titebond III® for joining this cutting board because it has waterproof properties, and a longer open time. Titebond II®, which is water resistant would have worked equally well and has been used successfully by a lot of folks who have built these cutting boards.

Field Panel Glue Up

The issue of glue open time is an important one, especially for this cutting board design, since the field pattern is composed of so many strips. I found that I was unable to glue up all of the strips in the field panel without exceeding the open time of the Titebond III® glue. In my first attempt, I tried to glue all of the strips in one operation and found that by the time I had glued and loaded all of them in the jig, the glue had set up enough that I couldn't move the strips enough to eliminate the mismatch between some of the adjacent strips.

Therefore, I implemented a two-stage glue up sequence. Carefully keeping the field strips arranged in the proper order, I divided the number of strips roughly in half and glued, installed, and clamped them in the assembly jig with the last field strip against the edge stop on the jig and using hold down cauls to minimize mismatch. The lesser number of joints allowed me to complete this glue up operation within the glue open time and I was able to reposition the strips to minimize the mismatch problem. Placing the field strip against the stop provided a more straight edge to work against for the second stage glue up. Whatever tolerance build up in the stack of strips occurred in the outside end border strip, which could be removed later in the final trimming.

In the second stage operation, I removed the half panel from the jig and turned it around so that the field strip was facing outward. Then I dry fit checked the total panel assembly and reworked any joints that had visible gaps. Then I glued and installed the rest of the strips against the edge of the first stage panel and clamped and glued the total panel, clamping cauls across the panel.

This two stage glue up method worked very well and was used for the field panel, end border panel, and final cutting board panel glue ups. This method effectively minimized surface mismatch on all of these panels.

After the glue dried, I drum sanded the field panel using a 100 grit belt to remove the excess glue and remove the small amount of mismatch present on both sides of the panel, **Figure 18**.

Figure 18 – Sanded Field Panel

It is interesting to note that at this stage of construction, the field panel or one similar to it, would make an excellent ***face grain*** cutting board, such as is used for cutting bread, etc.— a wonderful gift companion to someone who receives an end grain cutting board. If necessary, the face grain cutting board could be made narrower by omitting some of the strips. Another possible project would be to make a serving tray having the same wood species and field pattern as the end grain cutting board field panel. The bold face grains and vivid colors give the panel a totally different appearance than the end grain panel.

Using my crosscut sled, I cut the field panel crosswise into 1 3/8” wide strips, **Figure 19.** Due to the available stock limitations, I had to reduce the width of the strips from 1 5/8” which would have produced the 1 ½” final cutting board thickness specified in the original design specifications. However, this tradeoff produced an extra strip, which helped compensate for the loss of cutting board length produced by reducing the thickness of the field panel to remove the planer snipe. The strips were arranged in the order in which they were cut from the field panel to keep the grain direction consistent in the final cutting board.

When the panel got too narrow to cut on the sled, I cut the remaining strips against the table saw fence, using one of the sled-cut strips to set up the fence position.

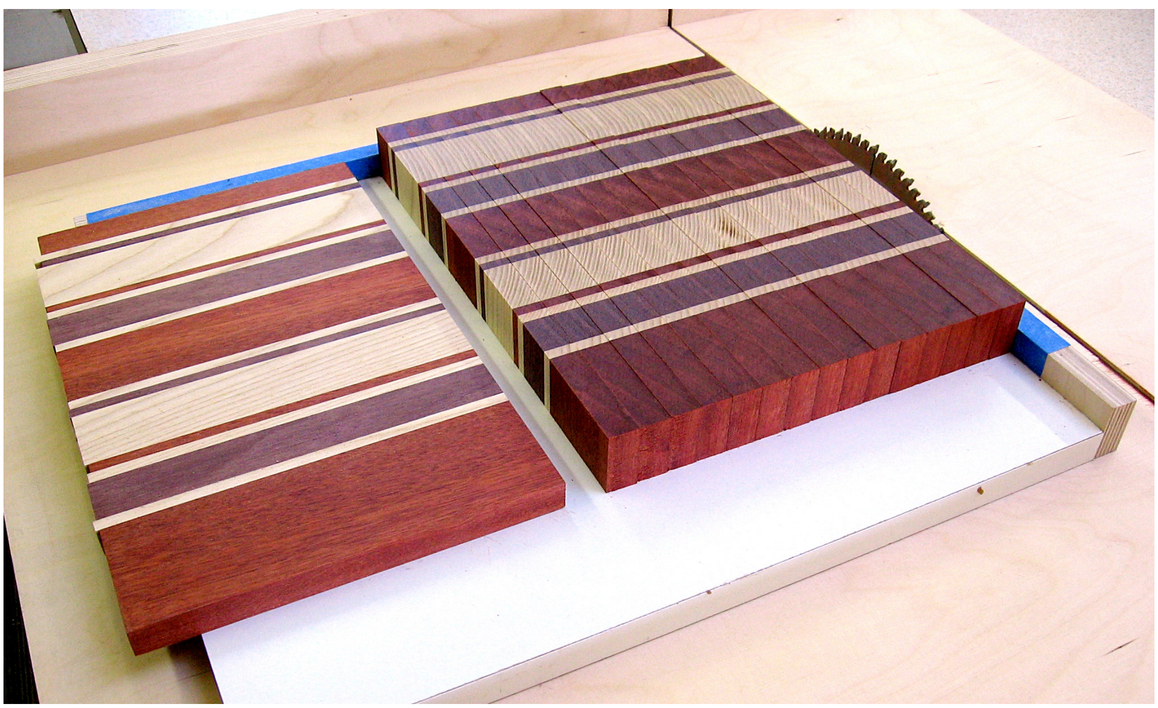

Figure 19 – Making Cutting Board Field Strips from the Field Panel

To produce the pair of end grain border strips to be added to each end of the cutting board field panel, a similar all Bloodwood panel, composed of strips of varying width, was also fabricated. This panel was fabricated by the same two stage gluing method, previously described for fabricating the field panel, using bar clamps and hold down cauls during gluing. This end border panel was subsequently cut up into 1 3/8”strips in a similar manner.

Cutting Board Panel Glue Up

After rearranging the field panel strips and adding the Bloodwood end border strips to the panel, the total number of strips (23) was divided in half for assembly of the cutting board panel. The same two stage gluing method, previously described for the field panel was used for fabrication of the cutting board panel. When the panel was dry, the excess glue was removed where necessary and the panel was drum sanded with the jig side down (because it was the flattest) on the sander platen using a 100 grit belt. After cleaning up the top side of the panel, it was turned over and the opposite side was similarly sanded.

Sanding

Some folks recommend sanding a cutting board to a maximum 150 grit. This is probably sufficient for cutting boards that are going to be heavily used and finished with some sort of oil finish like mineral oil.

However, I have found that sanding to a finer grit brings out more of the color and grain pattern of the wood species, especially on end grain. Therefore, I chose to repeat the drum sanding operations on both sides of the panel using successively finer grit belts:100, 150, 220 and 320 grits. Be aware that end grain is very hard, so patience is required to complete the sanding operations. Trying to take off too much material at one time, especially with the finer grits, may burn or discolor the wood. Proceed carefully and slowly.

After drum sanding, I used a ROS to sand both sides of the panel, starting with a 320 grit disk. Sanding was continued until all of the directional scratches from the drum sander were removed. I then dampened the surfaces with water to raise the grain and resanded with a 400 grit disk when dry. Note that some species, like Ash, will respond more to grain raising than some of the harder wood species. The grain raising and resanding were repeated until the grain would no longer raise.

At this point, the cutting board panel was ready for final trimming to size on the table saw and routing of the radius profile and undercut cove on the edges. The routing operations were performed against a fence on a router table. Sharp bits and a steady feed speed are necessary to prevent burning or discoloration during routing. The edges and the undercut areas were then sanded up to 400 grit. Again the grain was raised by dampening with water and resanded as necessary.

Applying the Feet

To prevent the board from skidding around on a countertop, four hard rubber feet were installed on the bottom surface of the board in accordance with the design drawing. Stainless steel screws were used to secure the feet to the bottom of the board.

Finishing

As with a lot of woodworking projects, there are different schools of thought about finishing cutting boards. Some say leave the board unfinished; others say apply some sort of food safe oil; and yet others say use an oil and wax finish.

There are several food safe finishes recommended for cutting boards. The most common and least expensive finishing method involves multiple coats of mineral oil. The two main drawbacks to this finish are 1) it substantially darkens the end grain areas, and 2) it is a nondrying oil, which never dries or hardens. If mineral oil is used, it may not be possible to see the difference in color or grain pattern between adjacent segments of different wood species. In fact, the grain pattern of dark colored woods like Bloodwood, Purpleheart, and Walnut may not even be discernible.

Other types of oil finishes, such walnut oil, lemon oil, etc. are also commercially available, but all of them will darken the appearance of the end grain as well. Sometimes beeswax is added to an oil to produce a more durable finish. However some beeswax finishes seem to produce a dull appearance and slightly sticky feel to the surface.

So I guess the choice of finishing method is a matter of personal preference. Cutting boards intended for heavy use may benefit from the minimal protection provided by an oil finish. Boards which are seldom used or are more of a decorative design may be left unfinished or waxed with a food safe wax product.

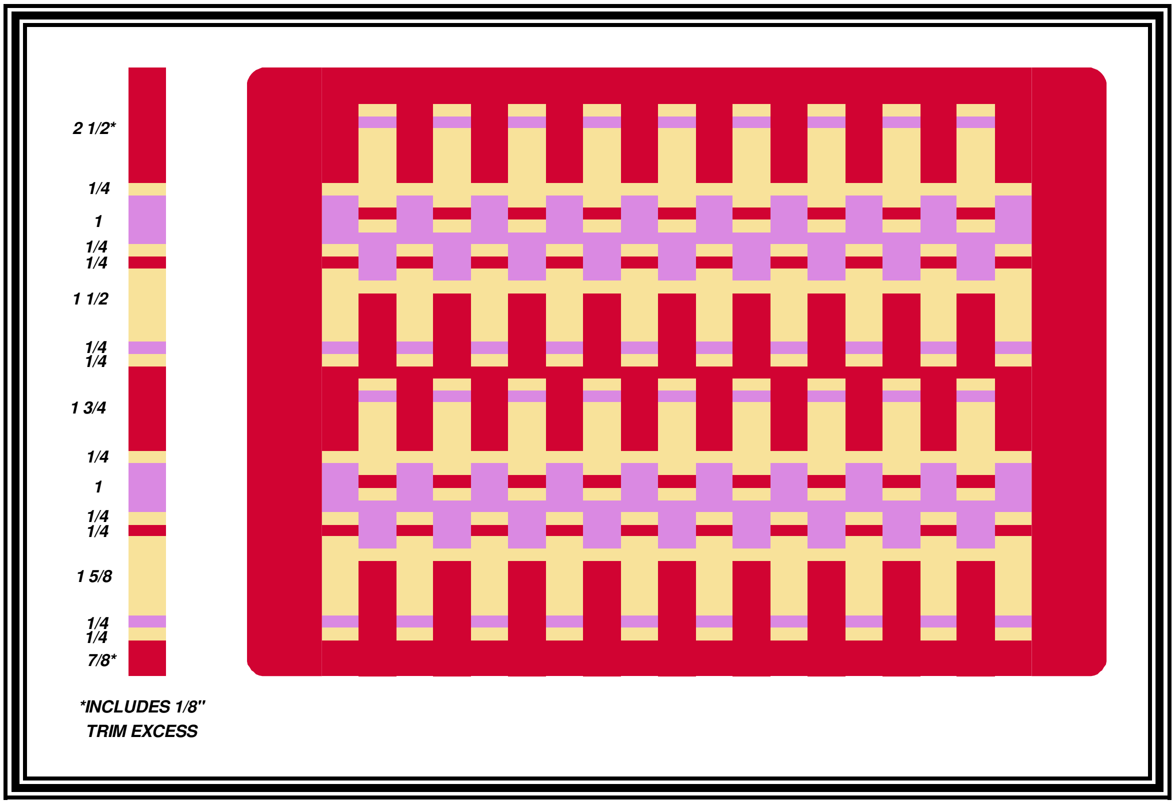

Figure 20 – CAD Developed Field Pattern 1

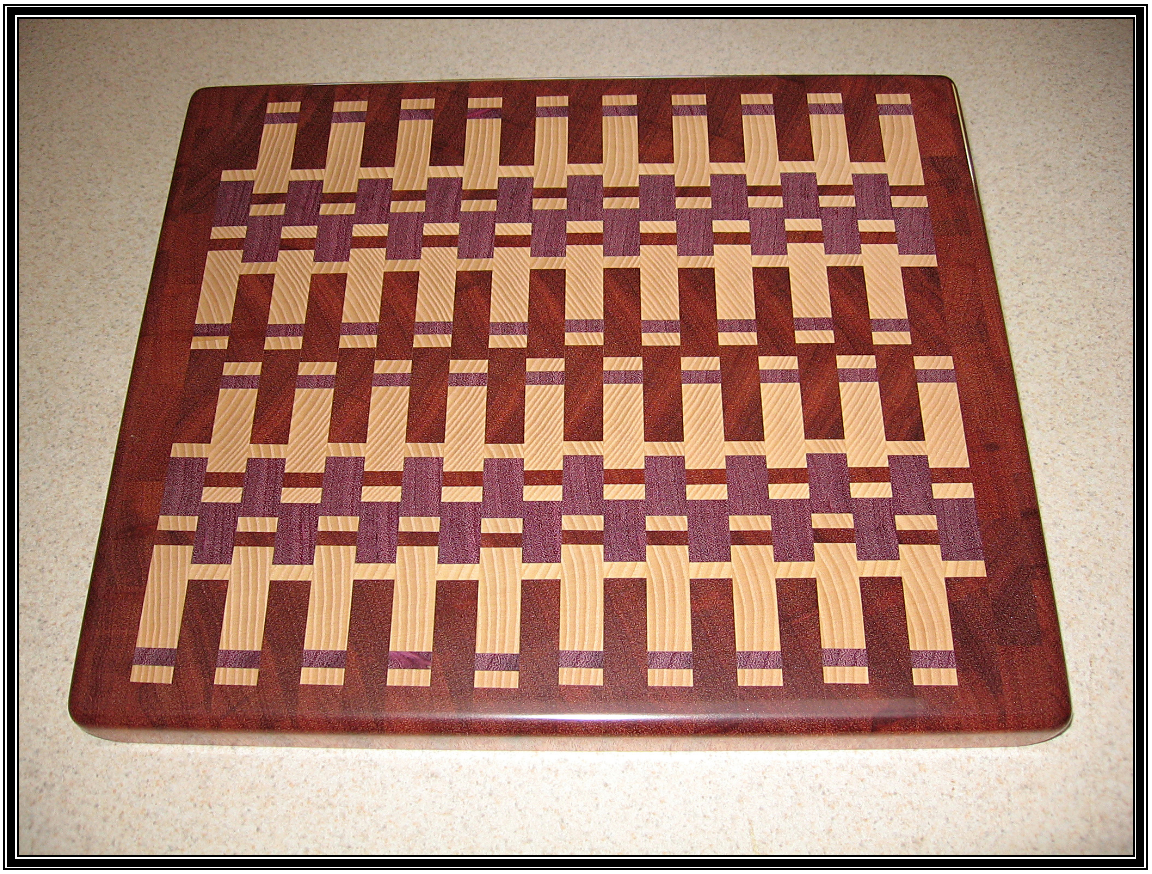

Figure 21 – Cutting Board 1

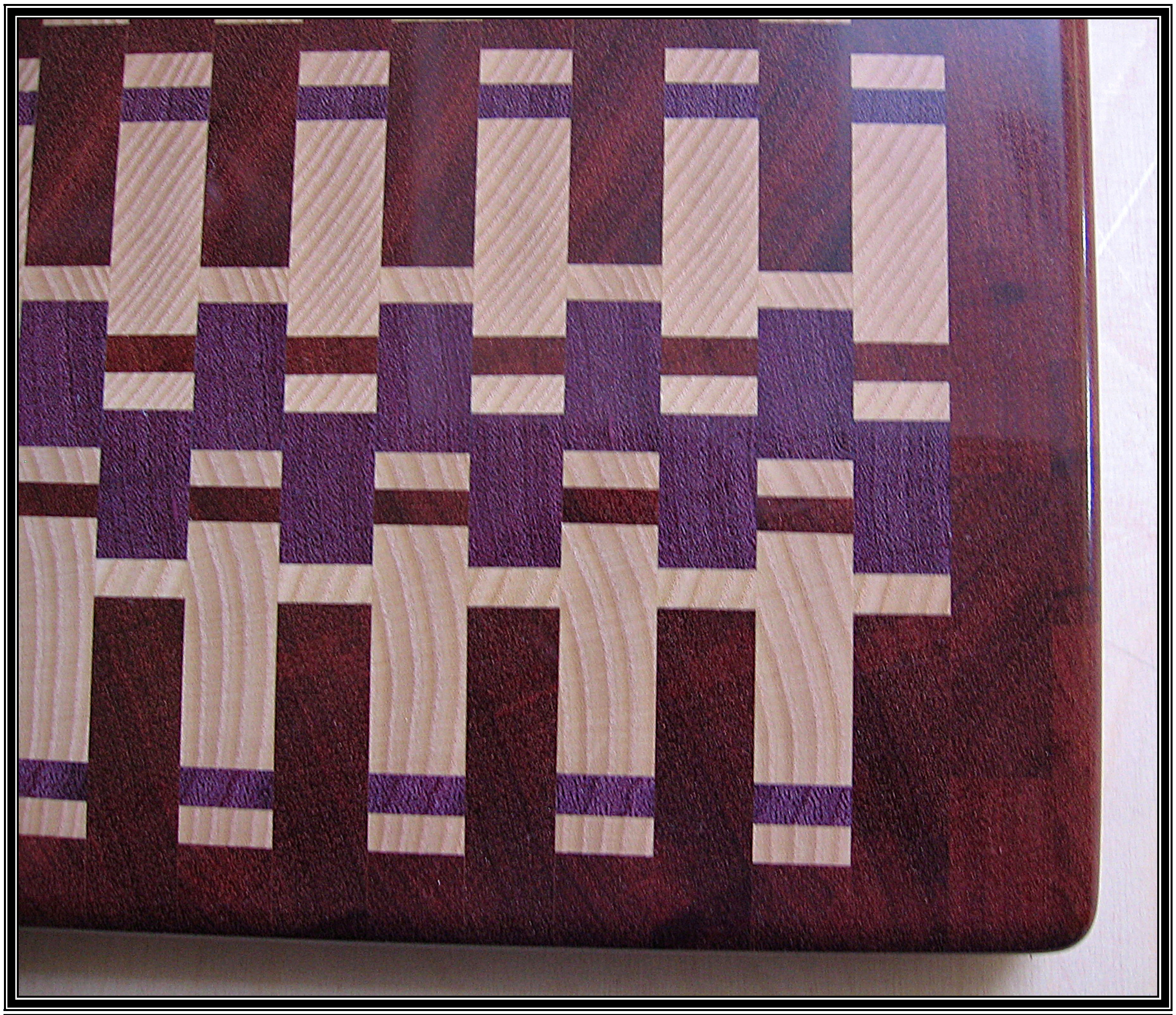

Figure 22 – Cutting Board 1 Pattern Detail

OTHER FIELD PATTERNS AND CUTTING BOARDS

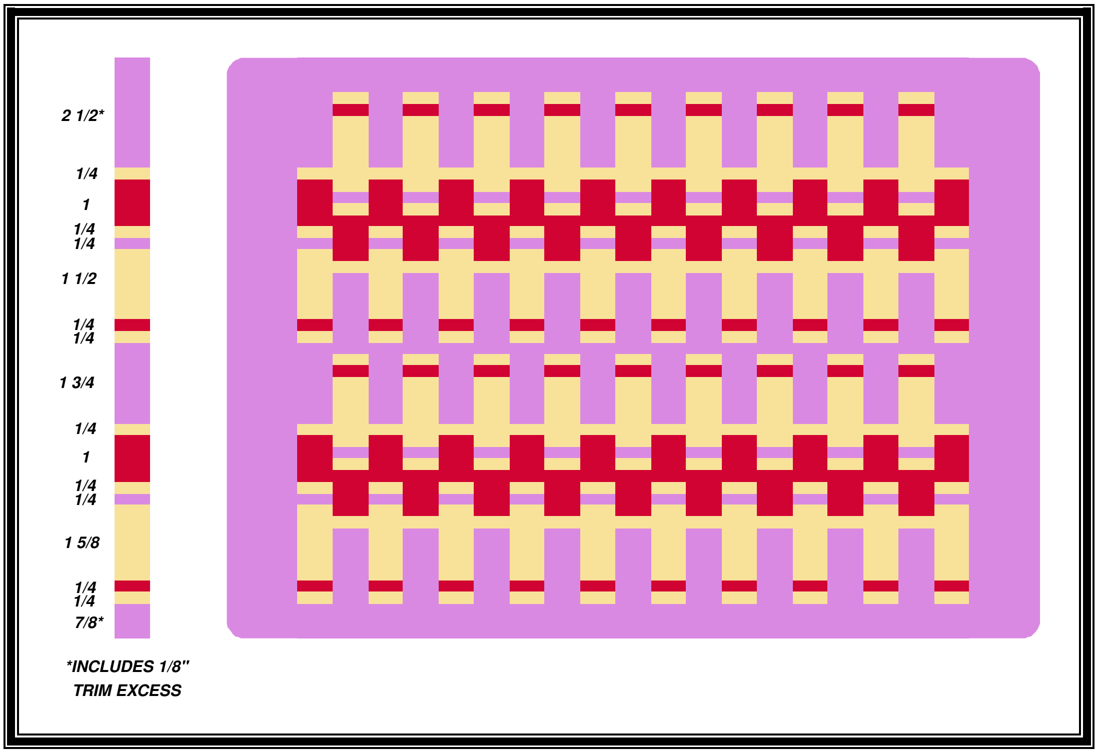

Figure 23 – CAD Developed Field Pattern 2

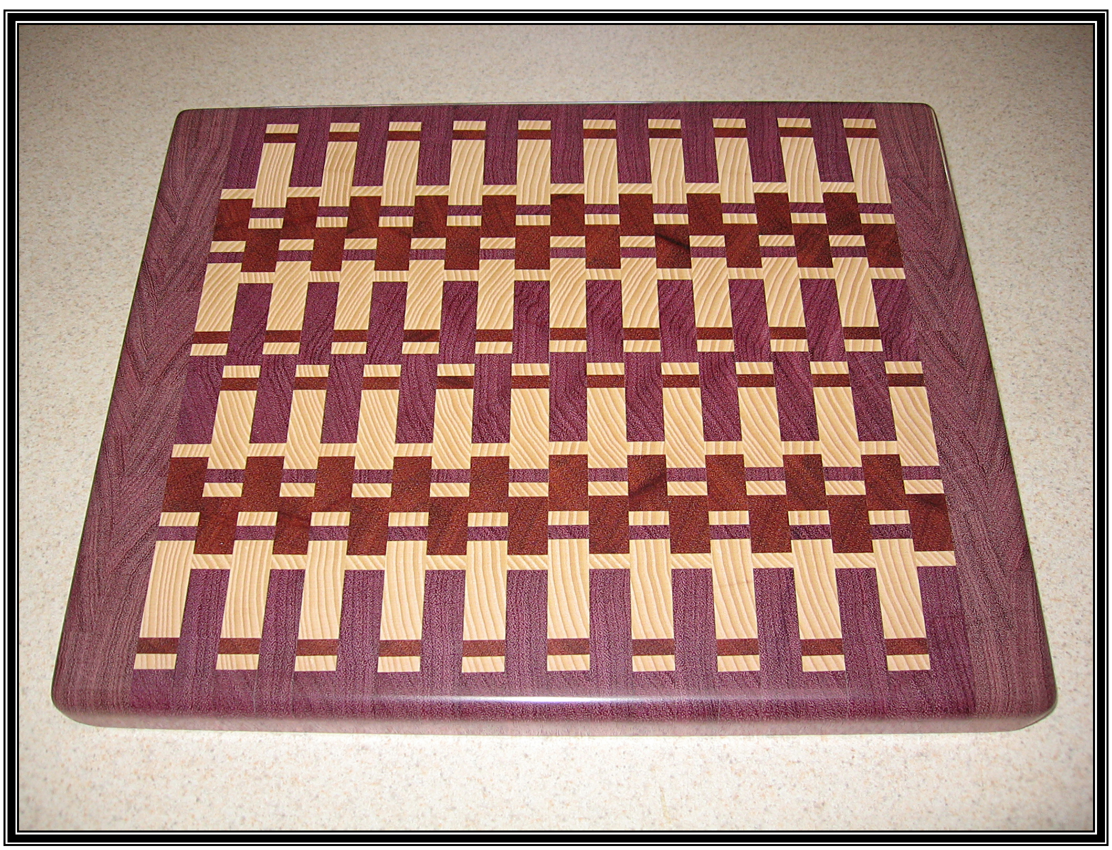

Figure 24 -- Cutting Board 2

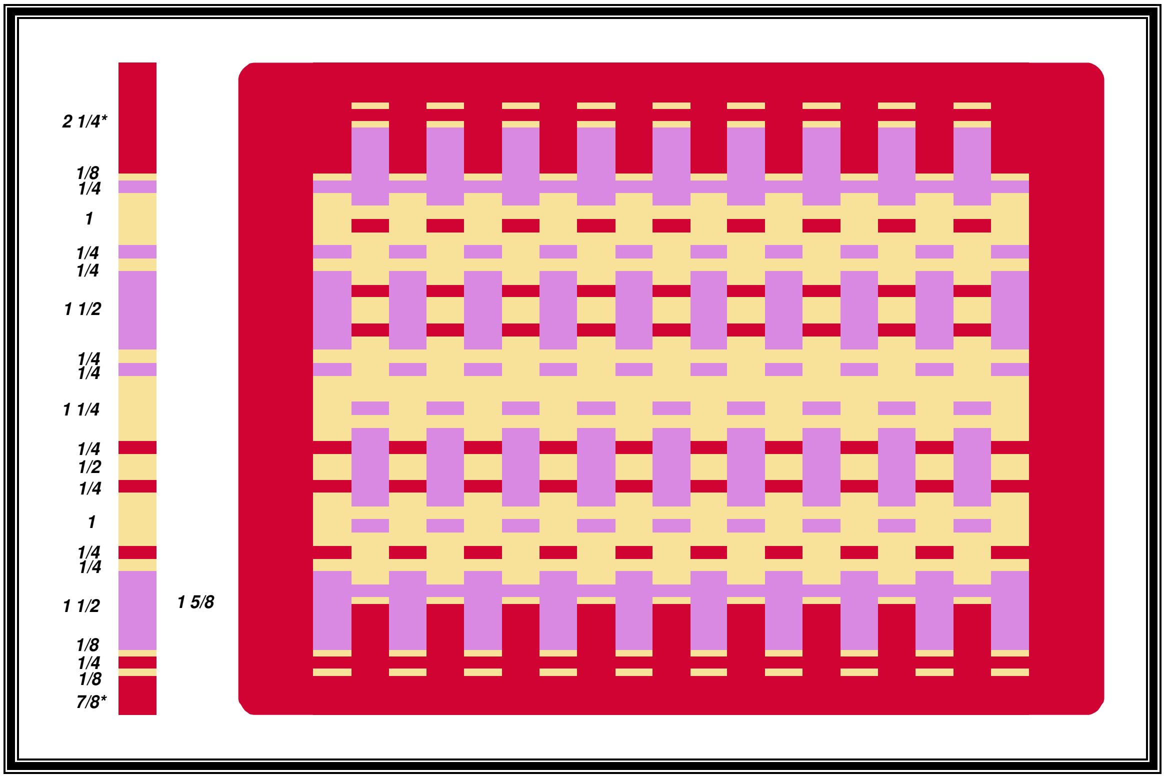

Figure 25 – CAD Developed Field Pattern 3

Figure 26 -- Cutting Board 3

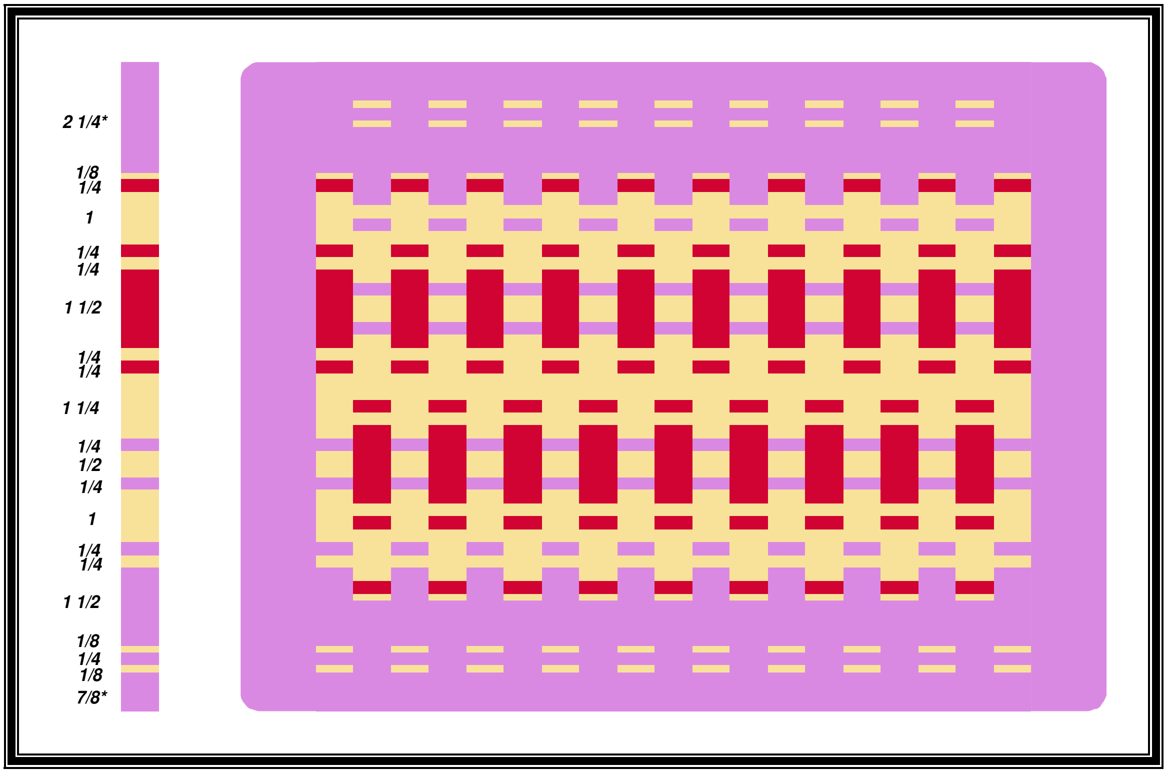

Figure 27 – CAD Developed Field Pattern 4

Figure 28 -- Cutting Board 4

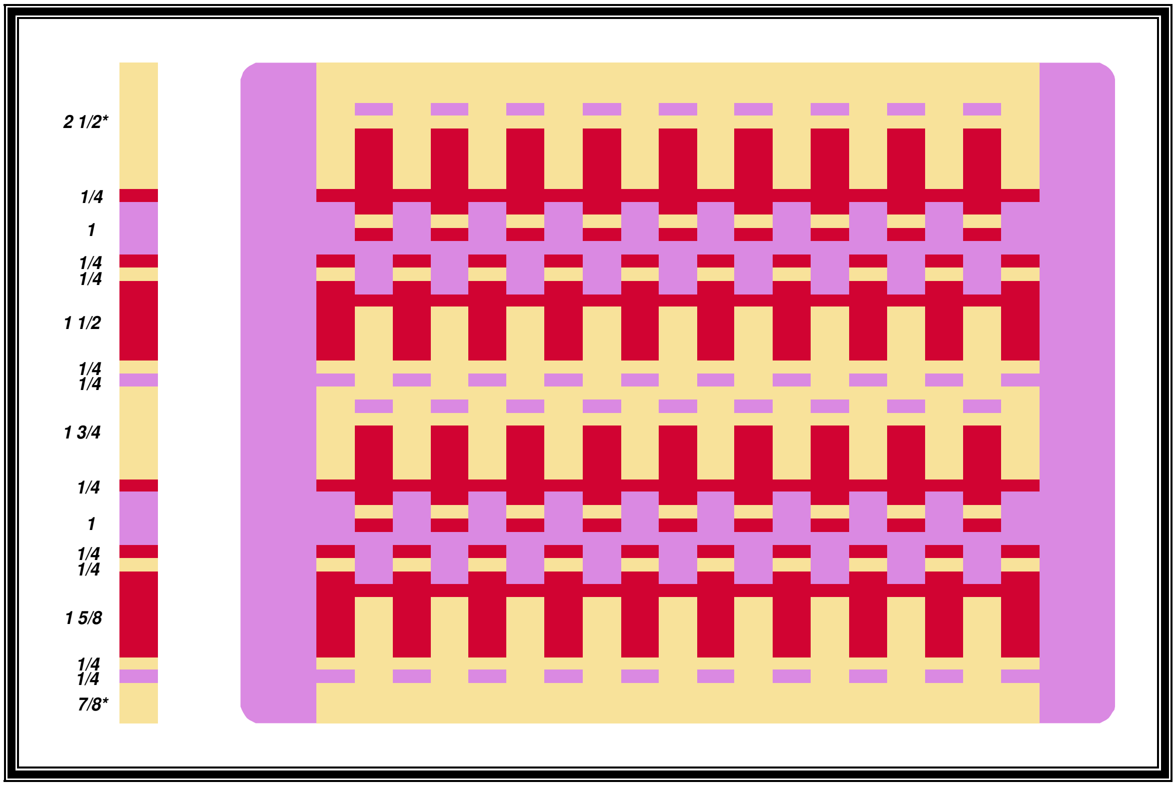

Figure 29 – CAD Developed Field Pattern 5

Figure 30 -- Cutting Board 5

Lessons Learned

Snipe – may be difficult to avoid. Best solution is to provide excess stock length to allow cut off of snipe areas. Additional stock length is recommended for making a couple of extra field panel strips to increase cutting board length if necessary, or to replace damaged or defective strips.

Cauls – greatly aid in minimizing surface mismatch between panel strips. Recommended for use with field panel and cutting board panel glue ups.

Mismatch – minimize mismatch between adjacent field and cutting board panel strips by use of cauls.

Glue Open Time – balance number of joints with the allowable open time for the glue selected for the project. Make multi-stage glue ups if necessary.

Zero Clearance Inserts – use zero clearance inserts for sawing field panels into cutting board strips. Chipout or tearing of cut edges may produce surface voids in the cutting board joints.

Backing Strips – use backing strips to support edge material when routing edge profiles to prevent chipout/tearout of panel corners.

Oil Finishes – Work great, are easy to apply and renew, but make the end grain very dark and dull.

Patience – a great virtue highly regarded in the Bible and in woodworking. Especially valuable when coping with the estimated 10,000 to 1 million passes (☺) through a drum sander required when sanding an end grain cutting board.

Acknowledgements

I would like to thank my cousin and fellow woodchip, **Herb Stoops**, for his advice and willingness to share his experiences from his cutting board building projects and for his support and encouragement to make this presentation.

I would also like to thank my kids, **Joel, Kristin, Jennifer,** and **Amy** for their patience in waiting so long to receive the “Sticks” that Dad told them he was making them for Christmas 2006. I have every expectation that after receiving their cutting boards, they will consider the wait as having been worthwhile. Will they cut on them? Who knows, but I know I couldn’t bring myself to do it.

For Further Information

For further information or questions you might have should you decide to try making one of these end grain cutting boards, please contact me via email:

pmstoops @comcast.net

I may not have the answer, but I will at least try to come up with one. Or contact me in person at the next Northwest Woodworker's Guild meeting.

Wishing you happy and safe woodworking.

About the Author

I am a native of the Pacific Northwest and have lived here all of my life. I began woodworking in my father's home shop some 60 years or so ago.

I am a retired engineer who was fortunate enough to enjoy a 40+ year career working in the research and development field for The Boeing Company.

I am blessed to have a number of quality woodworking machines and a nicely cluttered shop area to operate them. I enjoy using my CAD program to make computer drawings of all of my projects -- and sometimes the projects even come out looking somewhat like the drawings.

I enjoy working with beautiful woods and learning new skills and techniques to make my projects easier to build and of higher craftsmanship and quality. I have found that some of the online woodworking forums can be a good source of woodworking experience and information.

I have been a member of the Northwest Woodworker's Guild since early 2006.

Note

Paul M. Stoops
February 2007