

## Month 6: Compound Weaves with Supplementary Sets: Unit Weaves

Last month we studied supplementary weft weaves which belong in the “compound weaves with supplementary sets” in the Emery classification. This month we will study another group of weaves which belongs to the same group: the unit weaves, of which summer and winter is the most widely known.

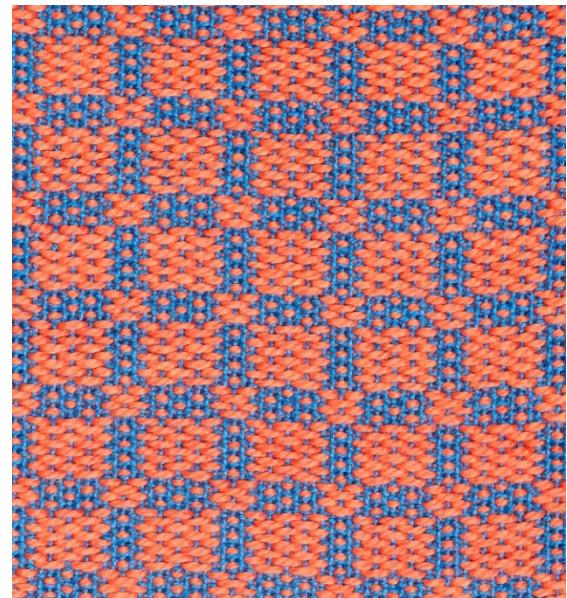
In her book *Summer & Winter, A Weave for All Seasons*, Donna Sullivan expands Emery’s classification by saying that summer and winter forms what is called area patterning since different areas of the cloth have different textures resulting from the supplementary weft. Thus, she thinks that Emery’s classification for summer and winter is a supplementary-weft-float patterning.

Unit weaves, sometimes called tied unit weaves, have an additional pattern weft superimposed to a ground as the supplementary weft weaves do. But the similarities pretty much stop there.

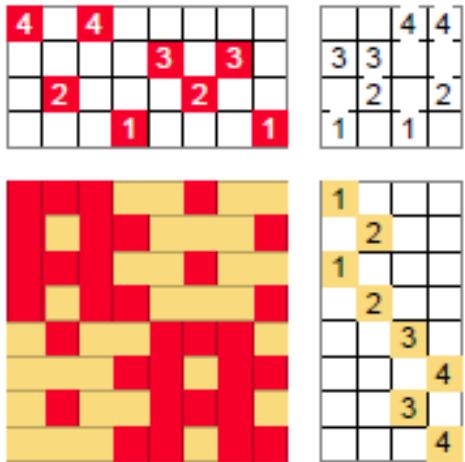
Unit weaves produce blocks that have the following characteristics: 1) floats are anchored (“tied”, hence the name); 2) each block is fixed in width; 3) blocks can be repeated without compromising the structure of the cloth because the floats are tied after a given number of threads (the number of which depends on the specific structure); 4) blocks are independent (they don’t share pattern shafts) and thus can be combined.

There are so many possible unit weaves that some don’t even have a name, they are named by their nomenclature (see below), often called classification, but I prefer nomenclature to keep it separate from Emery’s classification. There are two possible tied weaves on four shafts: summer and winter, the most widely used, and barley corn.

Let’s use summer and winter to look at the characteristics of unit weaves and the nomenclature which was described by Donna Sullivan.



## Summer and Winter



On the left are the two blocks of summer and winter on 4-shafts.

For the threading, notice that shafts 1 and 2 are in common in the two blocks. Block A uses shaft 3 as the pattern shaft, block B shaft 4.

In treadling each block has two different pattern shots (besides the ground, more on that later): 1 and the pattern shaft, then 2 and the pattern shaft.

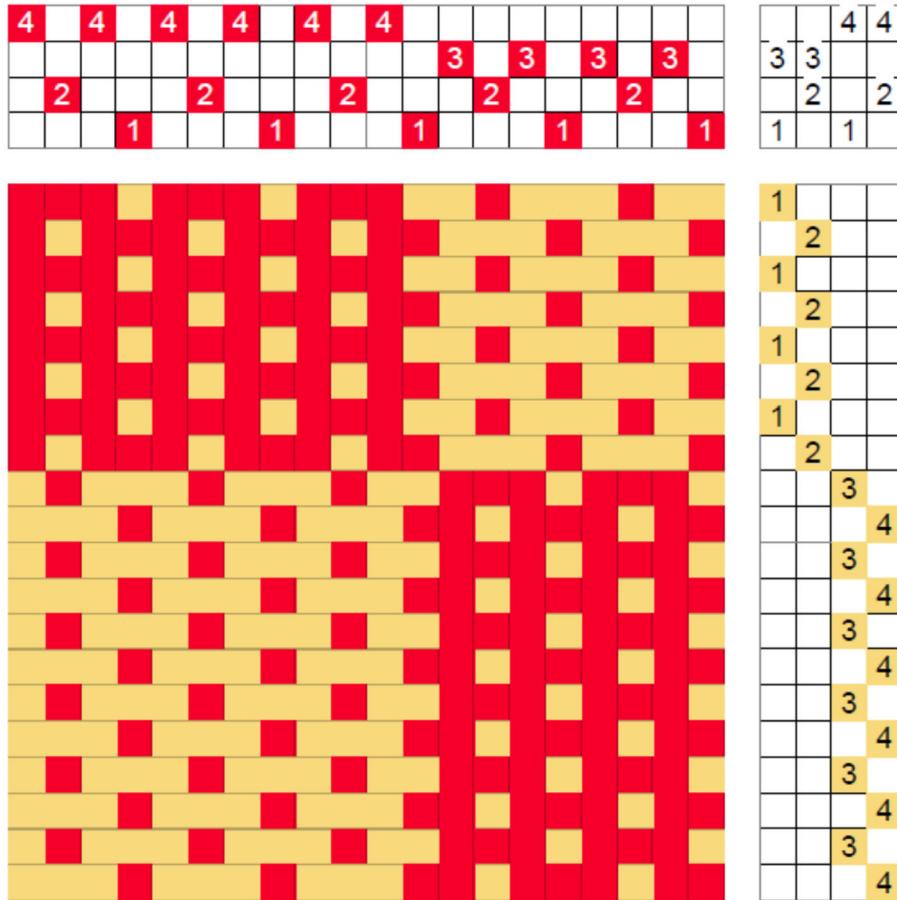
Now look at the drawdown: when the treadling is shaft 1 + the pattern shaft, the float is stopped by shaft 2 (or the next block); when the treadling is shaft 2 + pattern shaft, the float is stopped by shaft 1 (or the next block).

This means that in summer and winter floats are not longer than 3 threads.

By convention, when we talk about “weaving a block”, we mean that the block is covered by weft. That can occur in two ways while weaving: ***lower the shafts of the block*** to be woven, or ***raise all of the other shafts***. Visually, it is easier to think of the shafts lowered to be covered, which occurs in a sinking shed loom (counterbalance or countermarch). Here we will use this convention to discuss the blocks. Later we will see how to convert the treadling to a rising shed.

## Repeating Blocks

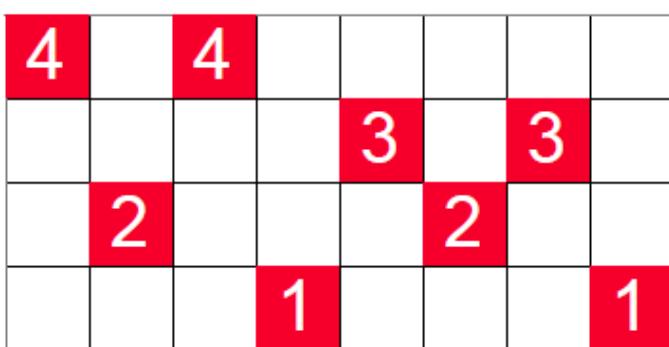
There are 4 threads in each block, and the treadling has also 4 picks of pattern in this particular treadling, called “single” (more on that later). In general, however, when we repeat blocks, we also repeat the treadling as multiples: two blocks of A, double the treadling for A. Below is a drawdown with two blocks of A and three blocks of B where the treadling follows this convention. Block A has a total of 8 threads for the two blocks; thus here are 8 pattern picks in the treadling. For block B, there are 12 threads for the three blocks; thus there are 12 pattern picks in the treadling.



## The Ground Tabby

Alternating with the pattern picks shown in the drawdown above, we have a ground that in summer and winter is tabby, which is not shown.

What treadling sequence will produce this plain weave?



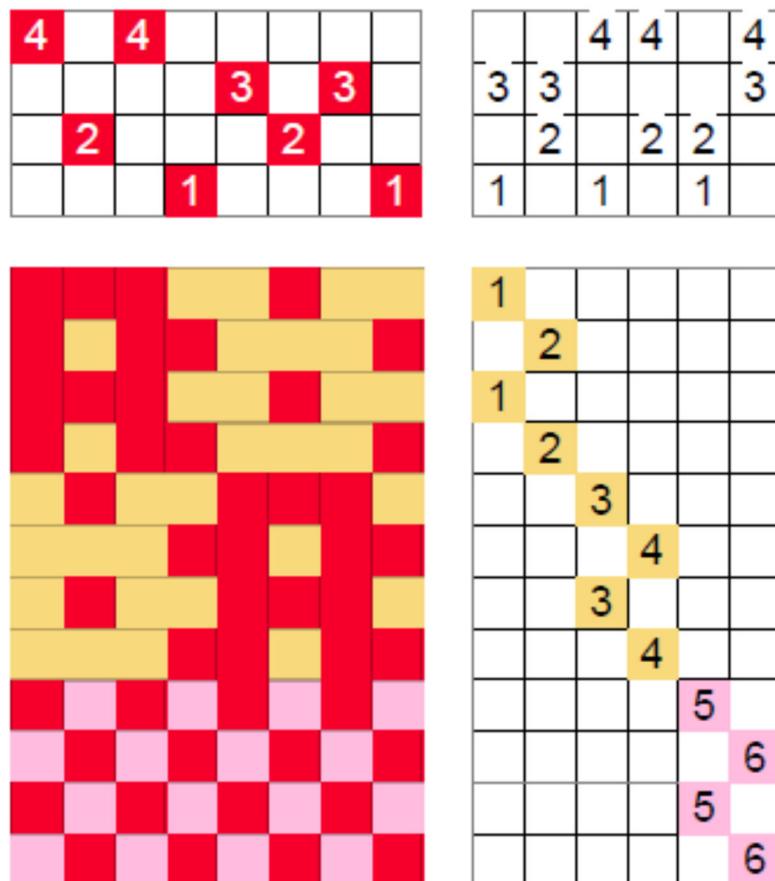
On the left is the threading draft. We know that to weave plain weave, we need to have every other thread up and every other thread down; so let's list the shafts:

First treadle of the tabby, every other thread: 1, 2, 1, 2

Second treadle of the tabby, the alternate every other thread: 3, 3, 4, 4

Thus, the treadling for the tabby is: 1 & 2 vs. 3 & 4. The drawdown on the right shows the resulting tabby fabric at the bottom in pink.

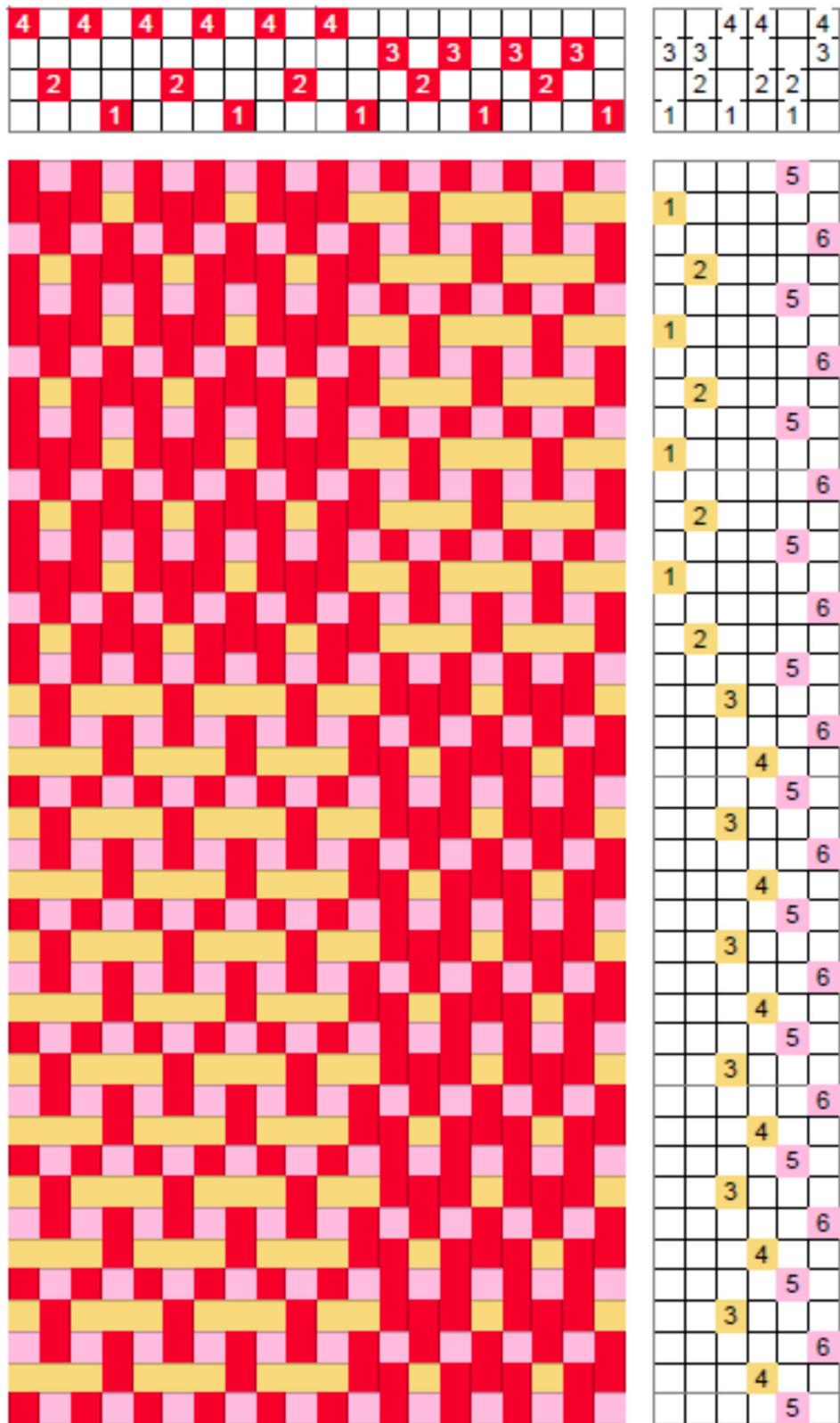
When we weave, we alternate the tabby pick with a pattern pick. The tabby is traditionally the same size and color as the warp, the pattern larger and loftier. In the drawdown, the tabby weft is shown in pink so that the interactions are visible.



The next drawdown shows the draft with two blocks of A and three blocks of B, as before, but treadled with the alternating tabbies which is how we actually weave.

The reason this treadling method is called “single” is because a single pattern shot is followed by a single tabby shot; that is, pick 1 & 3 is always followed by tabby 3 & 4. There are other treadling methods that pair the tabbies with the pattern picks (see below).

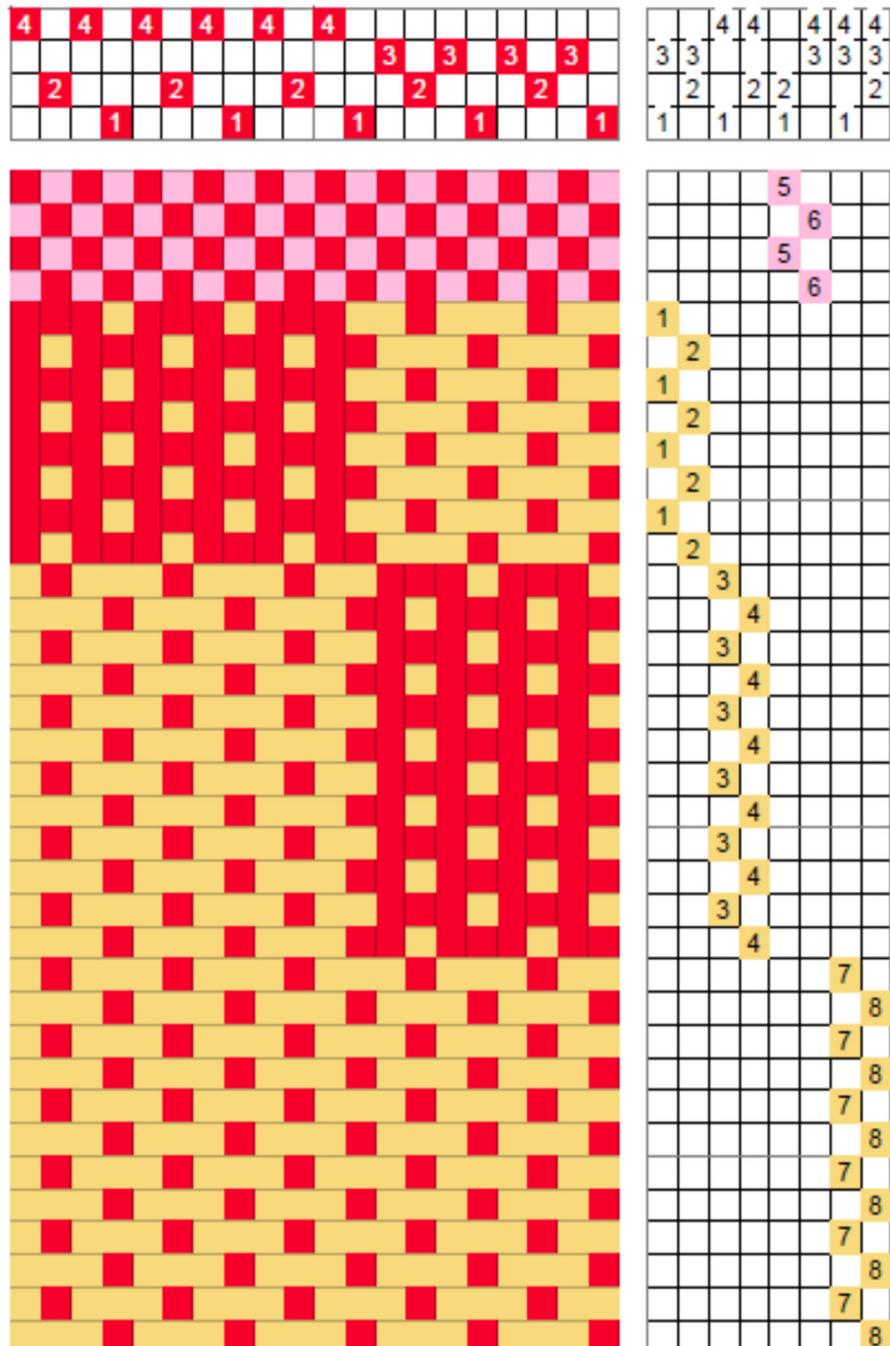
We have already mentioned that the weft floats are no longer than 3 threads; This is also true of the warp floats, as can be seen from the red warp threads in the drawdown.



## Combining Blocks

We have discussed all the characteristics of a tied weave – fixed block size, limited floats, repeated blocks – except the last one: blocks can be combined.

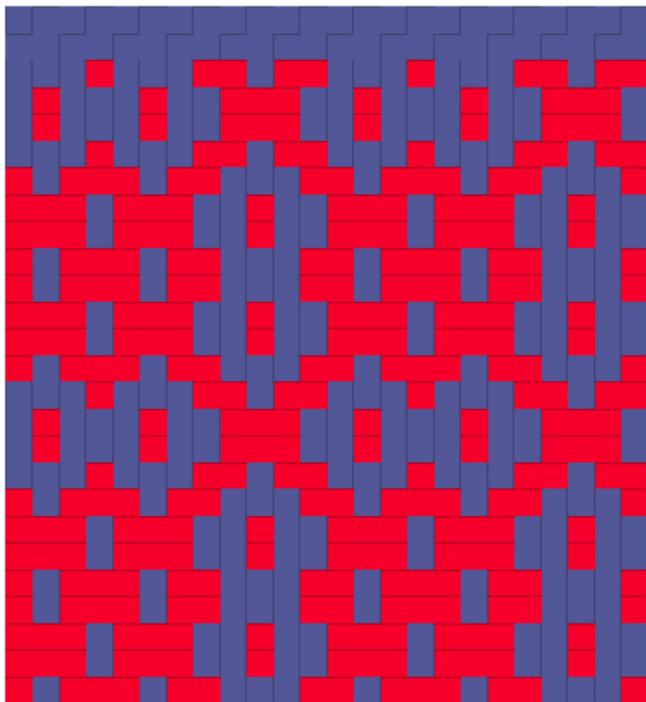
On the right is the previous drawdown (without tabbies), but here blocks A and B are treadled together. Since two treadled are taken up by the tabbies, weaving the blocks individually and together requires 8 treadles, or 6 treadles and 2 feet. For example, to combine the treadling of blocks A and B, we step on the first treadle of each block together, 1 & 3 and 1 & 4 for the first pattern shot; the second pattern shot is 2 & 3 and 2 & 4. The last two treadles in the drawdown show these combinations.



## Treadling Options

4	4	4	4		3	3	4	4	4	4	3	3
2	2	1	1	2	1	1	2	1	1	2	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1

4			4	4
3	3	3		
2		2	2	
1	1	1	1	1



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previous examples, they alternate with the pattern pick, and they are the same as in the single, tie threads vs. pattern threads.

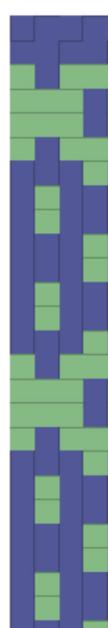
The drawdown above is the O's treadling, the one on the right is the X's treadling. Notice that both motifs form O's and X's, but with either the warp or the weft. The reverse is true on the other side of the fabric which is equivalent to being woven with a rising shed loom.

There are two other common ways to treadle summer and winter: paired O's and paired X's. The “paired” refers to the pairing of each pattern shot with each tabby, the O's and X's refer to the motifs that are formed.

The drawdowns here, for a sinking shed, do not show the tabbies between the pattern picks, but, as in the

4	4	4	4		3	3	4	4	4	4	3	3
2	2	1	1	2	1	1	2	1	1	2	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1

4	4	4	3	3
3		2	2	2
1	1	1	1	1



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## Converting from Sinking Shed to Rising Shed

Let's use the tie-up of the previous drawdown. To convert it from a sinking shed to a rising shed, we untie everything that is tied, and tie everything that is not tied.

Traditionally, the symbol “X” was used for the sinking shed loom and the “O” for the rising shed (“O” as in rising balloons) – unrelated to the O’s and X’s treadling discussed above.

On the left below is the same tie-up as in the drawdown, for a sinking shed; on the right is the same tie-up for a rising shed loom.

<b>4</b>			<b>X</b>	<b>X</b>		<b>X</b>	<b>X</b>	<b>X</b>
<b>3</b>	<b>X</b>	<b>X</b>				<b>X</b>	<b>X</b>	<b>X</b>
<b>2</b>		<b>X</b>		<b>X</b>	<b>X</b>			<b>X</b>
<b>1</b>	<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>	
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>

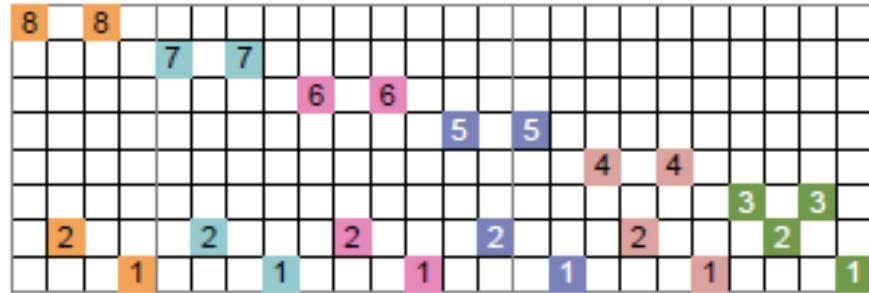
<b>O</b>	<b>O</b>			<b>O</b>				
		<b>O</b>	<b>O</b>	<b>O</b>				
<b>O</b>		<b>O</b>				<b>O</b>	<b>O</b>	
	<b>O</b>		<b>O</b>			<b>O</b>		<b>O</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>

Look at the 1<sup>st</sup> treadle of each diagram, in pink and follow the blue shafts: X’s on 1 and 3 on the sinking shed, O’s on 2 and 4 on the rising shed.

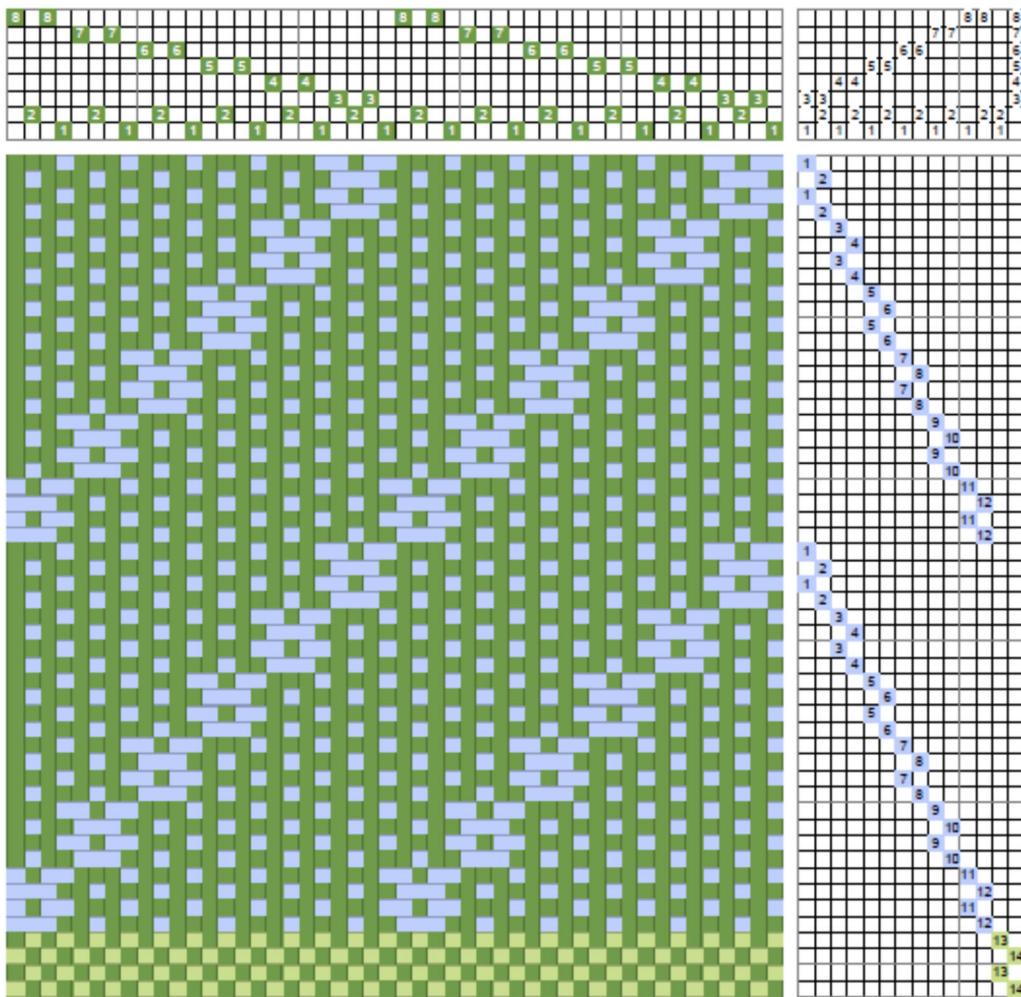
## Summer and Winter on More Shafts

One of the nice features of summer and winter and tied weaves in general is that, once we understand the “rules”, we can easily apply them to more shafts.

For summer and winter, we know the rule for threading: tied down thread 1, pattern thread, tied down thread 2, pattern thread, for every block. So, we can extend summer and winter to 8 shafts,, as shown in the threading that follows:



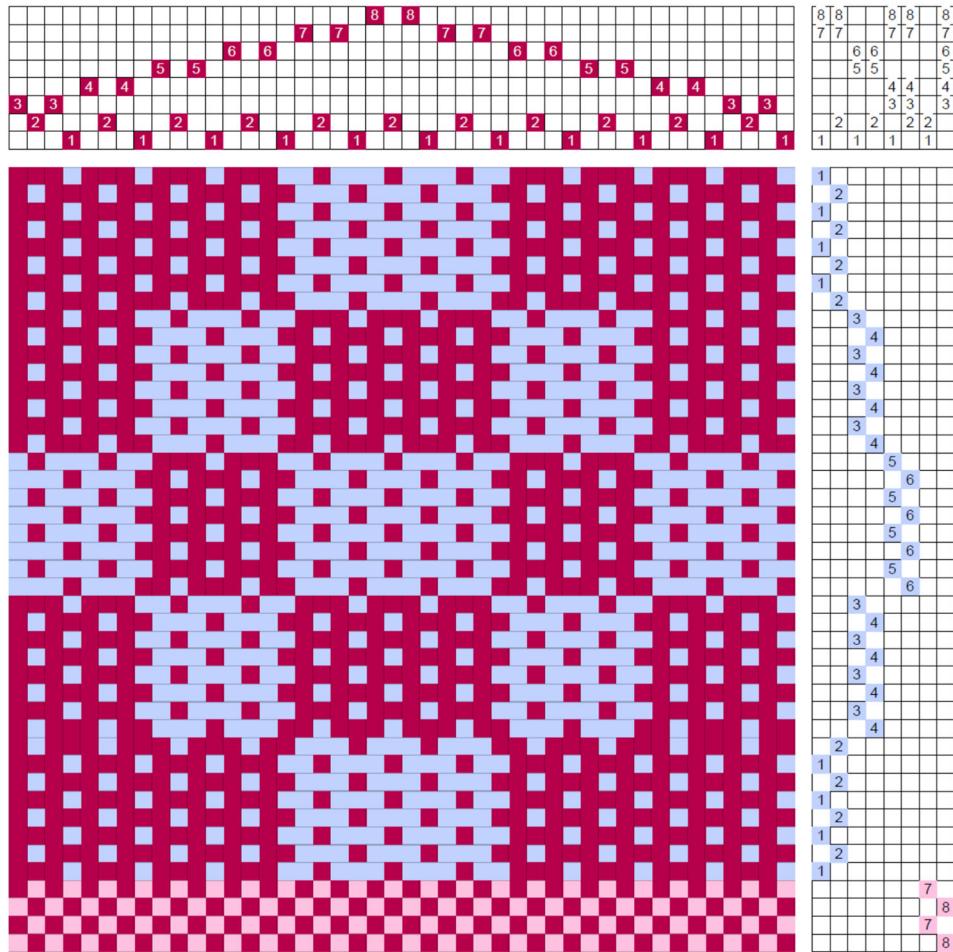
In the drawdown we see the rule for every block. There will always be 2 blocks fewer than the number of shafts available, since shafts 1 and 2 are the tied down threads.



For treadling single, the rules are the same, too. Each pattern shaft with each tabby. The tabby is 1 & 2 vs. all pattern shafts, which is as in the 4-shaft version. What appears as long warp floats

are not true floats, they are anchored by the tabby weft after every pick which is not shown.

Since with tied weaves blocks can be combined, motifs can be formed. The treadling, then, is the combination of the treadling of the combined blocks. Below is an example where blocks have been combined. The other advantage of combining blocks, besides the aesthetics, is that fewer treadles are needed.



As with the other drawdowns, the one above is for a sinking shed. Again, for a rising shed, we would raise everything not to be covered. For example, to weave the first combined block above, E + F, we would raise block A + B + C + D. Pattern books specify for which kind of shed the pattern was written, but by looking at the drawdown, we can tell; look at the treadling of E + F: blue covers the red, thus weft is covering the warp; the pattern is written for a sinking shed.

## Tied Weaves Nomenclature

The nomenclature is based on the threading because each tied weave has many treadling possibilities. As the number of shafts increases, the nomenclature is not always unique as we shall see. We will use summer and winter again to determine what the four parts of the nomenclature mean.

<b>Single, double, etc.</b>	<b>Number of pattern shafts per block</b>
<b># Tie shafts</b>	<b>Number of shafts for the tie-down threads</b>
<b>Paired or unpaired</b>	<b>Whether the ties are next to each other (paired) or not</b>
<b>Ratio</b>	<b>Tie-down threads to pattern threads within a block</b>

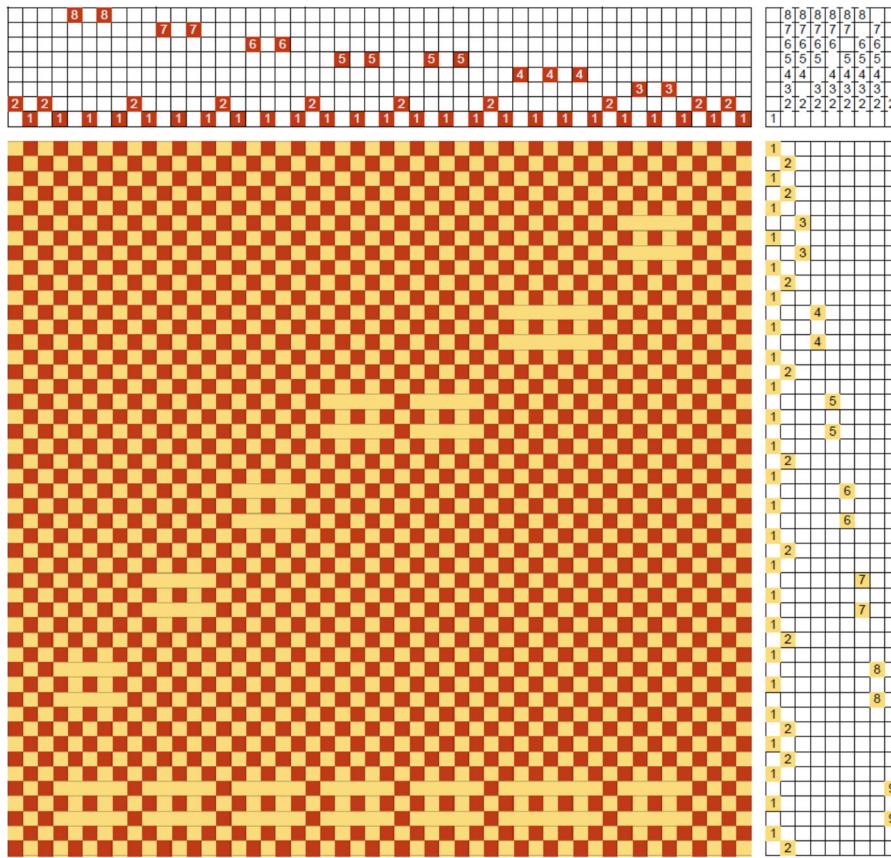
Using this nomenclature, summer and winter is called a **single, two-tie, unpaired with a ratio of 1:1**. This is true for the structure on four or more shafts. However, we usually don't specify unpaired (see paired below to understand why), and there can only be one ratio once we specify the "single" and the "two tie"; thus, we call summer and winter a single, two-tie unit weave. Here are the specifics for summer and winter:

Single	One shaft of pattern per block, 3 for A, 4 for B, 5 for C, etc.
Two-tie	Shafts 1 & 2
Unpaired	Shafts 1 & 2 are separated by the pattern shaft
Ratio of 1: 1	For each tie-down thread, there is a pattern thread

Let's look at each characteristic of the nomenclature and determine how it can be changed.

**Number of pattern shafts per block:** obviously at least one pattern shaft per block is needed, but more are possible with more than 4 shafts.

**Number of tie shafts:** Is one tie possible? Yes, with Bronson Lace (Atwater Bronson Lace), but I like to think of it as a hybrid, since it doesn't have all of the characteristics of unit weave.



On the left, notice that all the blocks can be woven together, a characteristic of unit weave, and the one that causes people to classify it as such.

However, while we traditionally use a 6-thread block for Bronson Lace, that block is not defined. Block A on the left has the

traditional 6 threads, but block B has 8. This is in contrast to summer and winter where the blocks are truly fixed, and if we changed them, we would change the structure; here we can extend the block and it is still Bronson Lace.

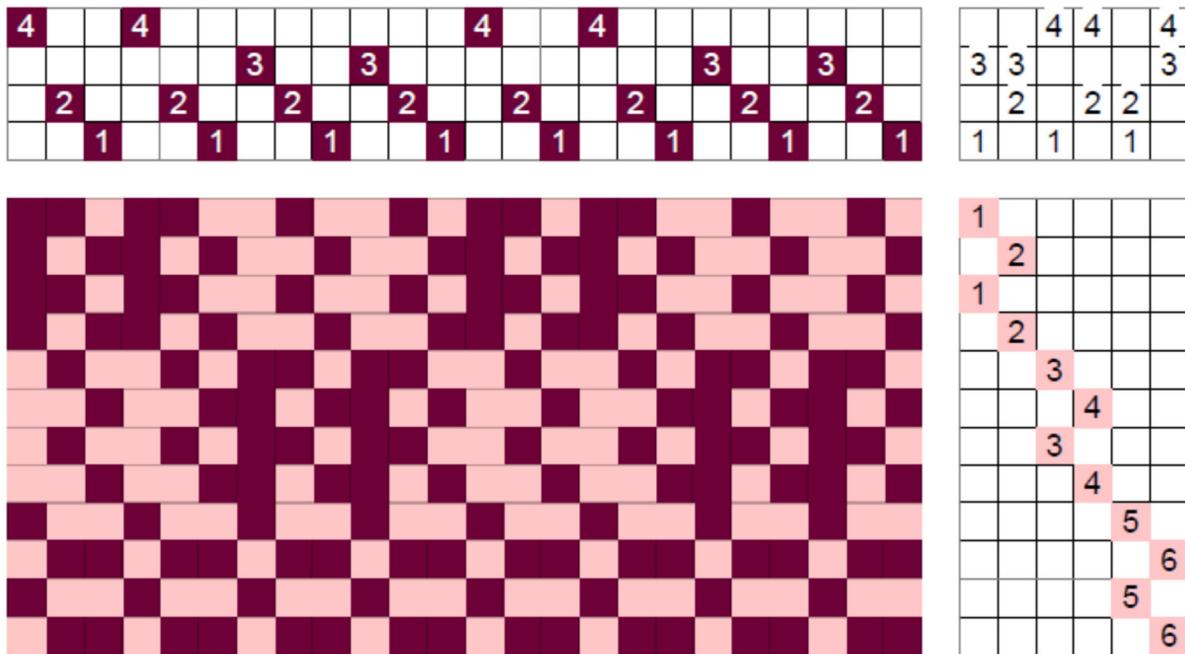
The blocks are tied by shaft 2, also a characteristic of unit weaves. To repeat the blocks, we can make them any width we want, but we can also place a thread on shaft 2 to limit the float, as shown in block C above.

If we look carefully, we realize that shaft 1 is NOT a tie down shaft, because the weft floats over threads on shaft 1. Unlike typical unit weaves, shaft 1, a pattern shaft, is repeated with every block, also making this structure a hybrid in my mind.

The unit weave classification is also not well defined: double (one shared), one tie, with a 1:? ratio, traditionally 1: 5, but that can change as we saw above.

**Pairing of tie-down shafts:** Can a structure with a single pattern shaft have paired tie-down shafts? It's possible, but we obtain a structure that is not very aesthetically pleasing, see drawdown below.

Plain weave is not possible with this arrangement; using the tie-down shafts vs. pattern shafts results in a pseudo basket weave with floats that are as long as the pattern floats. It is not a surprise that such a structure has not become common, if anybody has ever even bothered to try it. But it is a good exercise in understanding the different parts of the nomenclature.

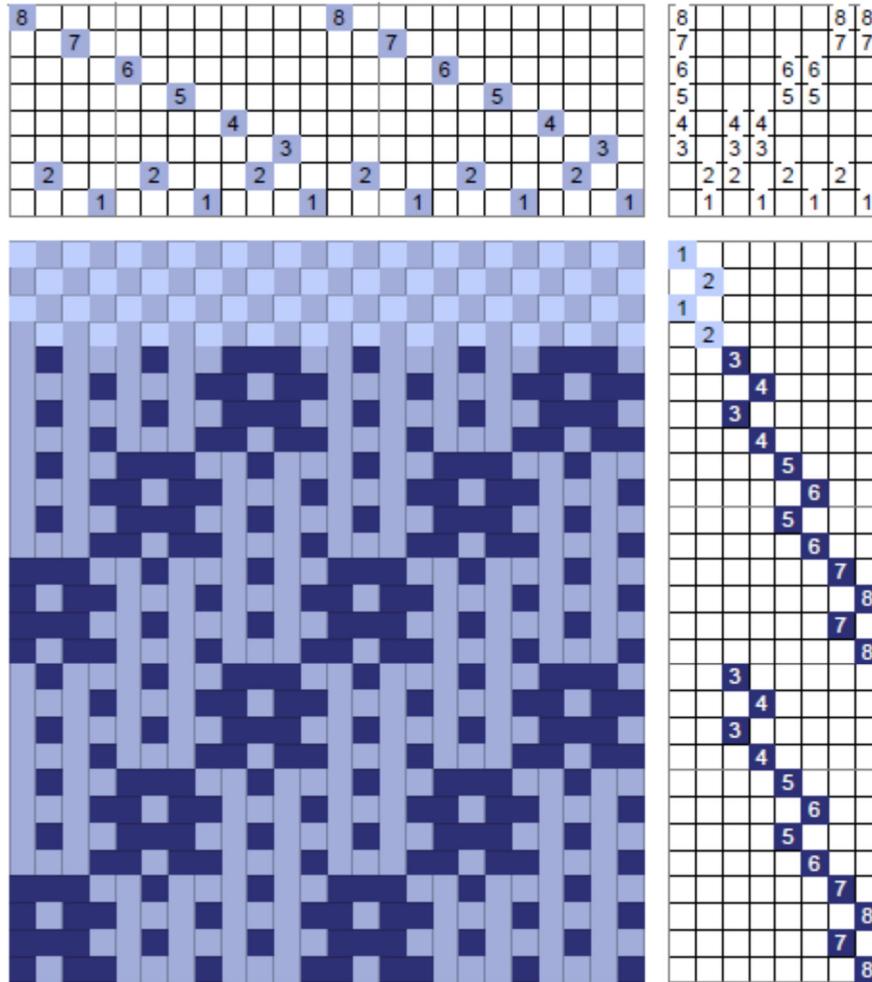


There are structures with paired tie-down shafts, but they require more than four shafts as we shall see.

**Ratios:** This structure in the above drawdown would be considered a single, two-tie paired with *a ratio of 2:1*: 2 tie-down threads for each pattern thread.

## More Structures with More Shafts

The next most logical set of structures are those that use two shafts per block. Then we have the option of how to arrange them.

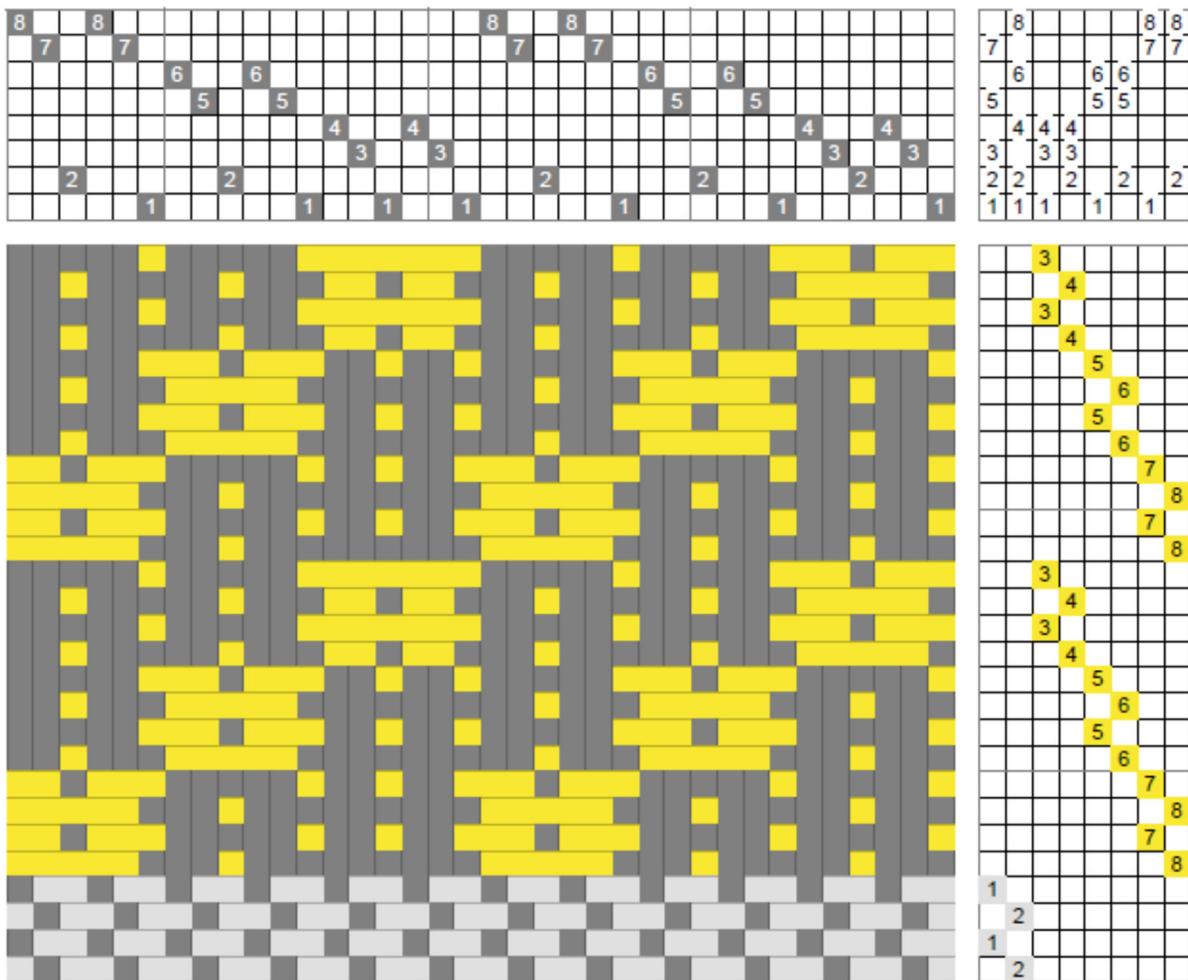


On the *left* is a **double two-tie unit weave; the ties are unpaired, and the ratio is 1:1**, one pattern shaft for each tie-down thread. Here I have just placed all the blocks in order. Strickler #592 and #593 have more interesting and aesthetically pleasing designs. With more blocks it is not unusual to

weave the motifs as a point arrangement (think pointed twill).

Keeping with two pattern shafts, we can group them, as shown in the *next draft*. This is a **double, unpaired two-tie unit weave with a 1:2 ratio**. It is also known as a 2:1 beiderwand (note the ratio transposed), which is a misnomer.

Note an important difference between these two double two-tie unit weaves; in the one that follows, there is no tabby possible; the ground is shown in the draft with the first two treadles; the light grey area at the bottom shows that the ground is a pseudo basket weave. The blocks are woven with a ground pick alternating with a pattern pick.

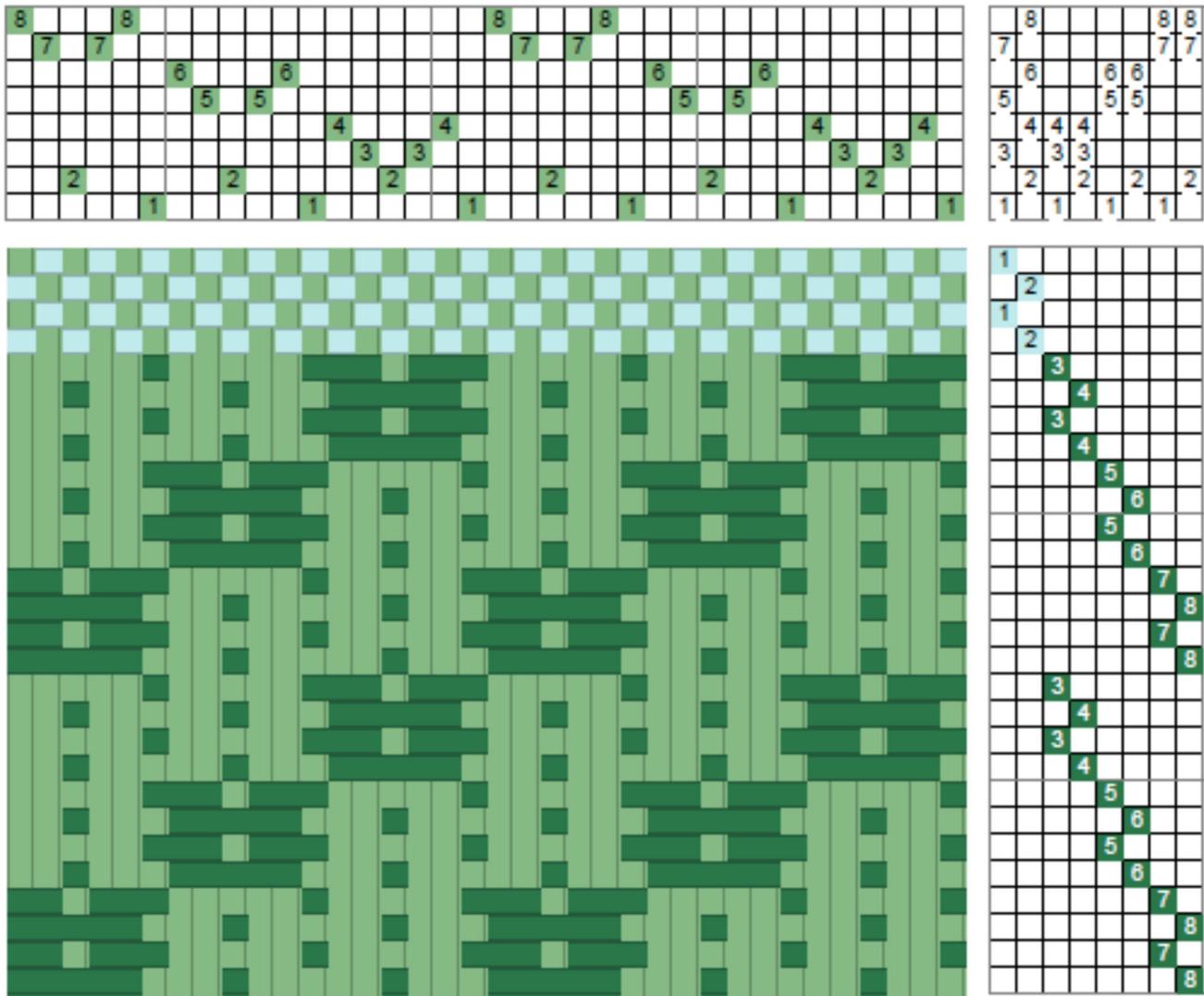


There are several structures called beiderwand with different ratios of ties to pattern shafts. Some of these fabrics have been considered double weave cloths because plain weave is formed behind the pattern seen in the front. However, the double fabric does not extend throughout the fabric. Donna Sullivan, in her book *Summer and Winter A Weave for All Seasons*, says that she does not like the beiderwand designation for these unit weaves because true beiderwand *is* a double weave cloth, with two warps and two wefts. Madelyn van der Hoogt has written a nice explanation of beiderwand in her “Ask Madelyn” column of November 24, 2015 (<https://handwovenmagazine.com/doubleweave-part-2-beiderwand-and-lampas/>).

To obtain a tabby background with the two pattern shafts together, they can be organized into a point, which will result in an odd and even order. This is shown in the next drawdown.

The tabby treadling of the background then is odd vs. even, different than tie-down threads *vs*

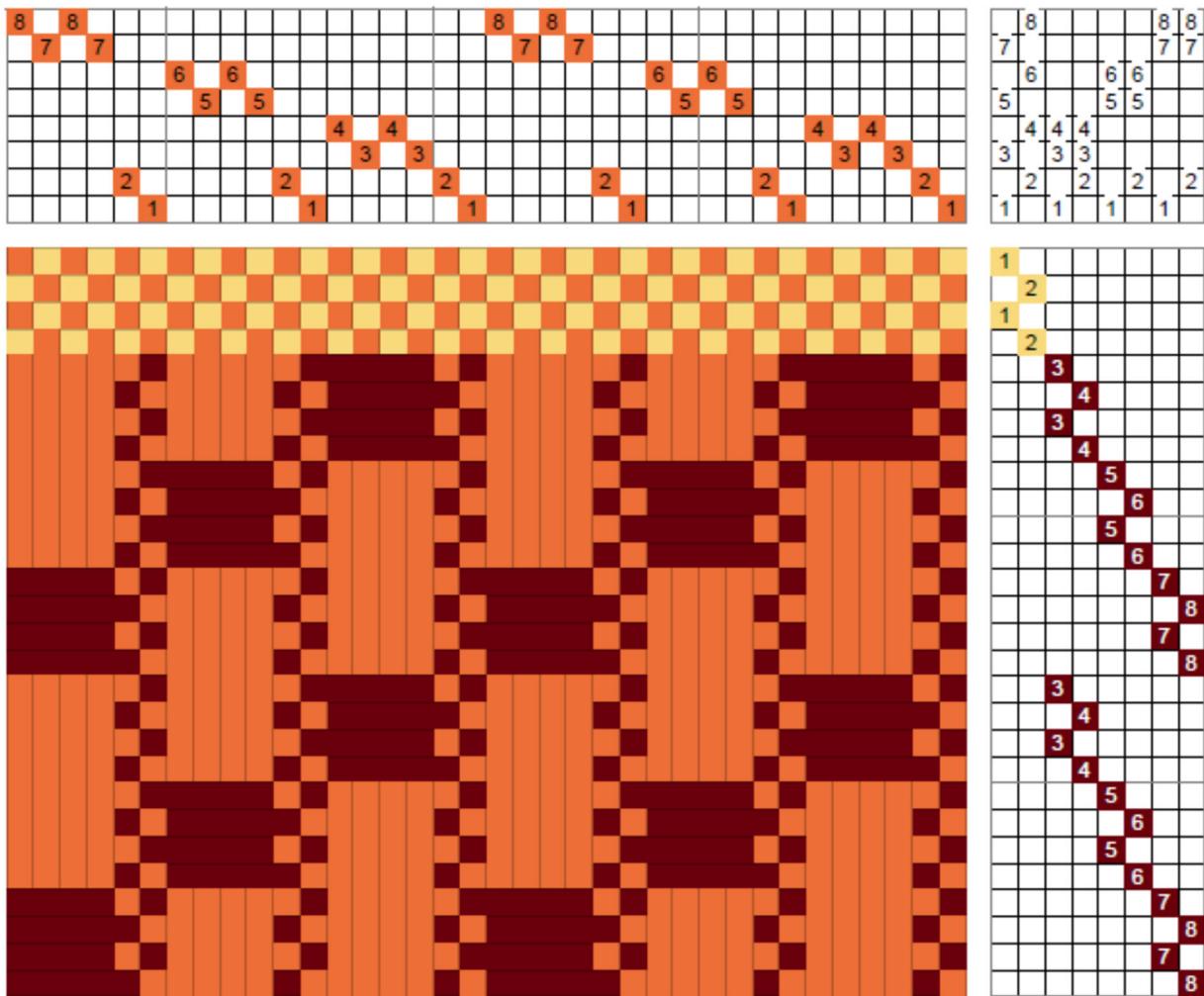
pattern threads of some of the other tied weave structures, including summer and winter.



This is **also** an example of a **double unpaired two-tie unit weave with a 1: 2 ratio**; the threading of the pattern shafts has been re-organized. As we use more shafts, the nomenclature is not unique because we have more possibilities for arranging the shafts. To keep them distinct, we can use the twill order to describe them.

The structure shown in the ***next drawdown***, called tied Latvian, is a **double paired two-tie unit weave with a 1:2 (2:4) ratio**. The tabby is also odd vs. even shafts. The treadling is both pattern shafts plus each tabby for two picks per block.

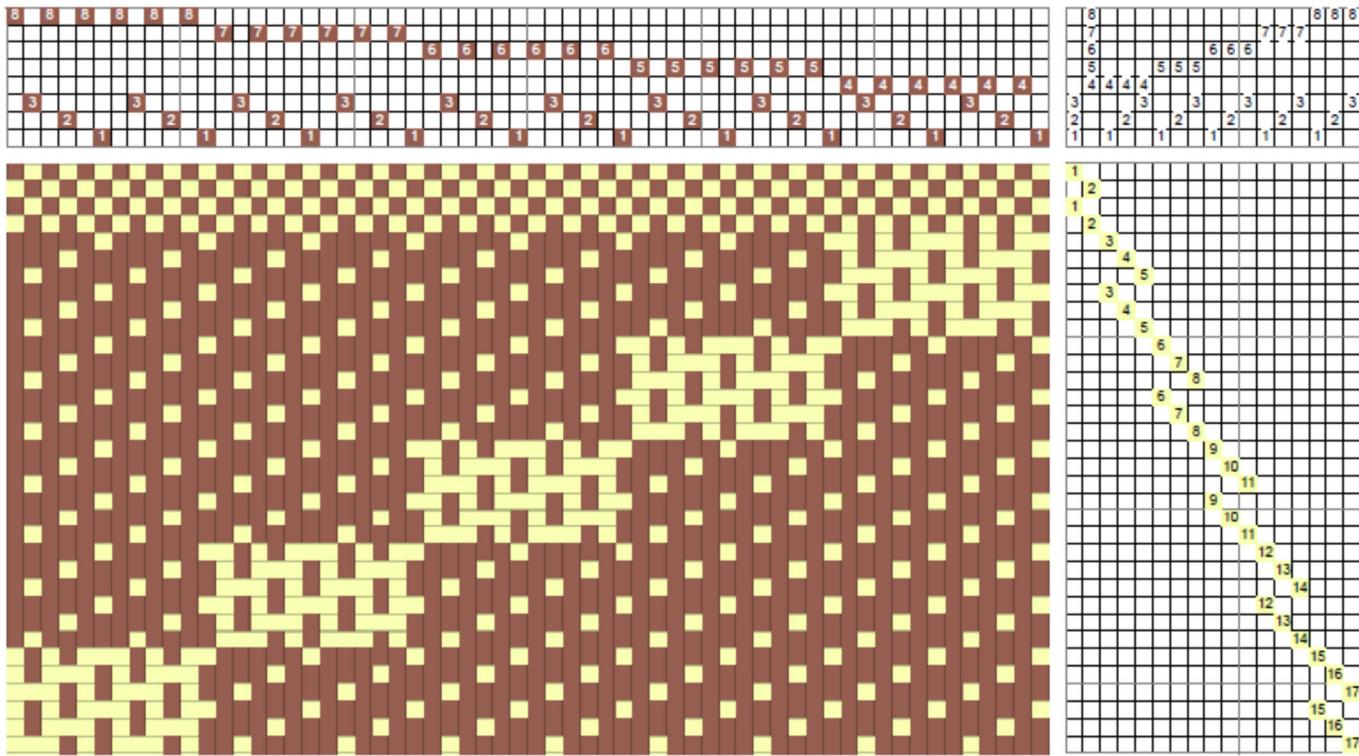
There is an alternate treadling which uses one pattern pick, shaft 2 plus the pattern shafts; it is repeated to square the block. It is called Tied Lithuanian.



The misnamed beiderwand is not the only one among the unit weaves. Half satin is another. Satin is a simple weave, as we have seen, one set for the warp and one set for the weft. Thus, the designation of half satin makes no sense. The drawdown, in the *next page*, shows that the structure is a **single, three unpaired ties with a 1:1 ratio**.

There are a number of tied weaves that use 3 ties and they can be arranged in a straight twill, as in the following example, or a pointed twill, or other combinations. Furthermore, while traditionally each pick consists of a tie plus the pattern shaft, more than one tie could be used for each pick.

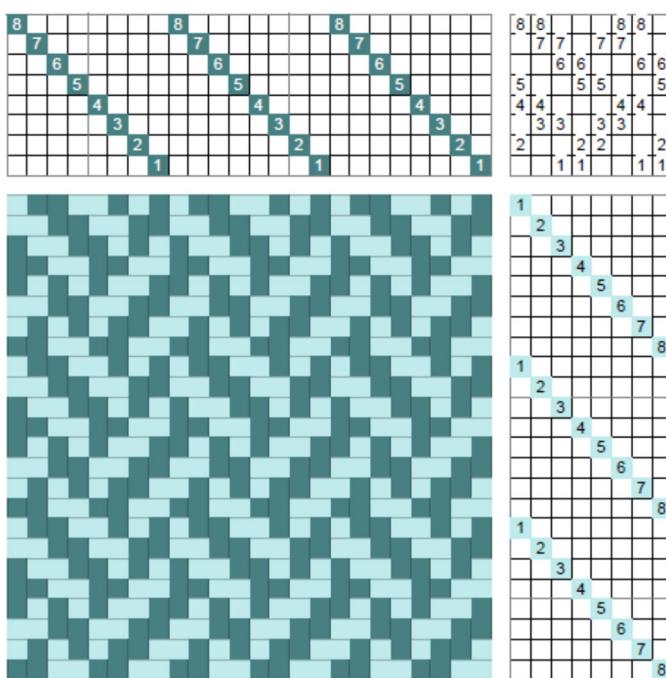
From the drawdown that follows, we can see that we quickly run out of treadles on an 8-shaft loom. Blocks can be combined so that they can form motifs against a background. Strickler has some nice examples (#600-602).

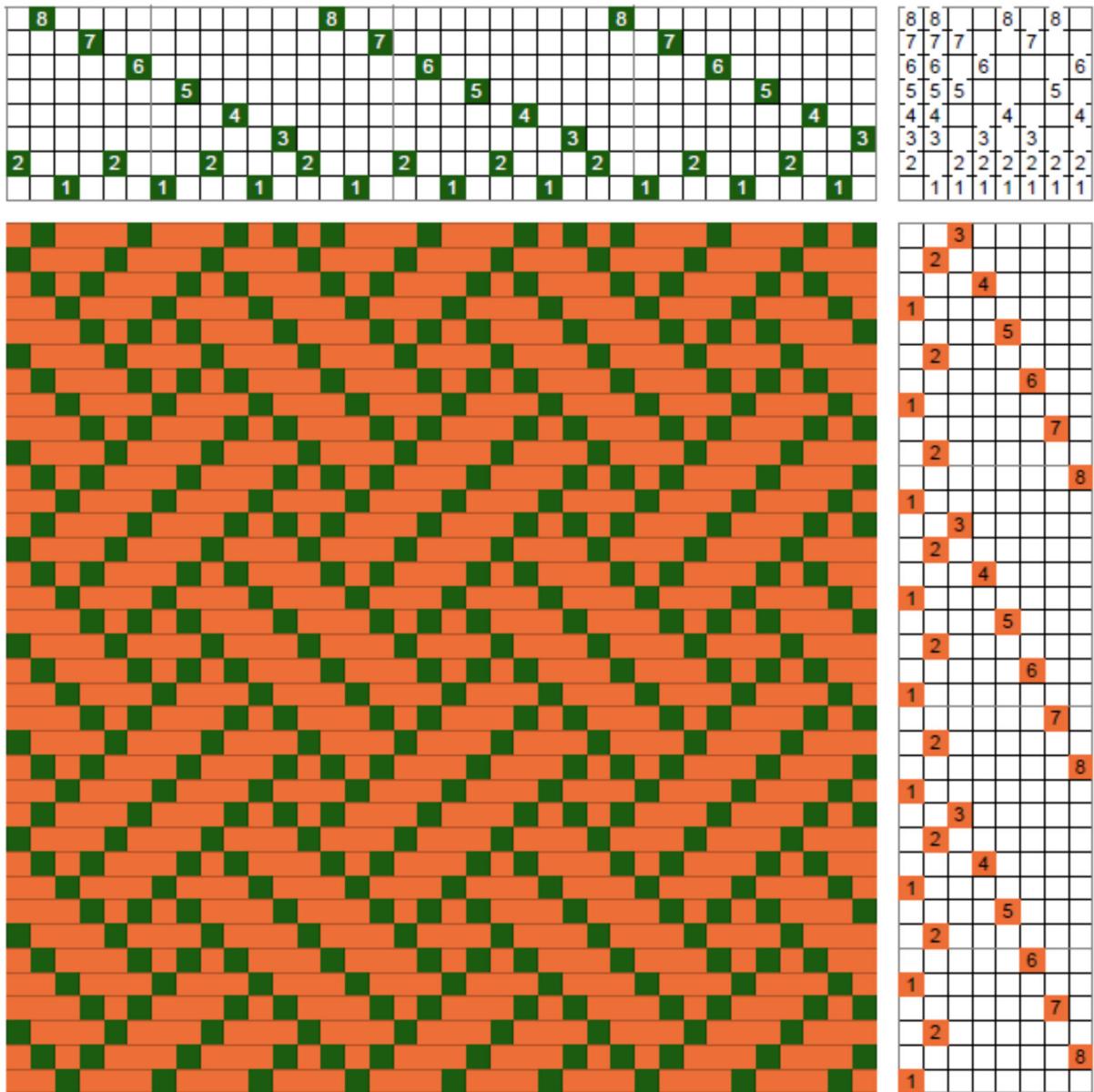


The tabby is formed by alternating the three tie-down threads *vs.* the pattern tabbies. The background is formed by staggered twill lines, reminiscent of satins, hence the misname.

To add to the confusion, the threading of unit weaves can be used for totally different structures,

notably plaited twills. Given the same number of shafts, a unit weave threading results in a much more complicated plaited twill than one woven on a straight draw. Compare the two plaited twill drawdowns that follow; on the left, the threading is that of a straight twill, the one below is the threading of a double two-tie unpaired unit weave with a 1:1 ratio. Both of these examples are from Strickler (#358 & #356).





There are many plaited twills that can be woven on tied weaves threading. However, since they are not a tied weave, do not weave them this month. The fabric, not the threading, determines the structure, and these fabrics, as twills, are simple weaves, not compound weaves.

## How Can We Use These Fabrics?

As with supplementary weft weaves, having two wefts makes these fabrics heftier. Traditionally they were used for coverlets. In fact, the name summer and winter comes from the weft being

more visible on one side, darker in color hence “winter” and the other side being lighter in color from the warp, hence “summer.”

Afghans, pillows, and household items can all be woven with tied weaves. The fact that the floats are fixed is an advantage. The thinner the thread, the lighter the fabric, so use that to your advantage in designing.

For this month, please follow these guidelines:

1. Weave a unit weave, 1 set for warp, 2 sets for weft, *one a supplementary weft*. On 4 shafts, you have two choices of threading and tons of choices for treadling.
2. Do not weave true beiderwand as it does NOT belong to this group.
3. Do not turn the draft; yes, I know, one weft is easier to weave but we will turn drafts separately. You first must understand the structure before you can turn it.
4. Do not use a tied weave threading to weave other structures, for example twills. Always, the fabric determines the structure.

## Annotated Bibliography

Donna Sullivan’s *Summer & Winter A Weave for All Seasons* is THE resource for unit weaves. Even though the book was published in 1991, it is as current now as it was then. She writes well with lots of examples and clear diagrams. (1991, Interweave Press)

Carol Strickler *A Weaver’s Book of 8-Shaft Patterns from the Friends of Handwoven* has lots of interesting unit weave patterns. People contributed swatches for the book, and she is careful to use the original weaver’s nomenclature, though it may be incorrect. The threading and treadling are, of course, correct. (1991, Interweave Press)

I have written some “Right from the Start” articles in *Shuttle Spindle & Dyepot* on the subject as follows:

Overshot and Summer-and-Winter - Compare and Contrast, 145: 21-26, Winter 2005/6  
Examining a Tied Unit Weave, 198:11-16, Summer 2019

A New Dimension to a Tied Weave 199: 11-17, Fall 2019