

PART III





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About the Author

Justin Sutera first got interested in primitive living skills when he was 14 after being introduced to 'The Tracker' written by Tom Brown. Since that time Justin has explored primitive skills deeply (often by trial and error in the early days). He graduated S.U.N.Y. College of Environmental Science and Forestry with a B.S. in Conservation Biology.

While still a student Justin founded ESF Primitive Pursuits Club. Additionally Justin has studied at the Tracker School and worked as an instructor at The Children Of The Earth Foundation before joining Primitive Pursuits as a full time instructor. Justin is particularly passionate about primitive bow (and arrow) making, flintknapping, and hide tanning but truthfully all skills for living with the Earth are of great interest to him.

As a lead instructor with Primitive Pursuits, Justin focuses on teen and adult programming including Wilderness Weekends, the Wilderness Skills Intensive, and the Wilderness Year program.

About Primitive Pursuits

Primitive Pursuits is a non-profit program in partnership with Cornell Cooperative Extension. We provide leadership and wilderness skills education to hundreds of toddlers, youth, teens and adults throughout the Finger Lakes region.

Since 2002 it has been our mission to steward the health of our community by fostering life-long relationships with the natural world through exceptional mentoring and nature education.

Through our mission, we work daily to achieve a cultural intervention that will bring back into our modern lives a necessary and healthy relationship with the natural world and within our human communities.experience,

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Introduction

First of all, I want to mention that there are tons of fantastic books and other resources out there on bow making. Many bowyers have done extensive research and really explored bow making as a detailed science. These are amazing resources, and I highly recommend you utilize them.

The information included here is from direct experience and has proven to work, as both my colleague Sean Cornell and I (pictured below) both successfully hunt deer with our handmade bows and arrows.

The intent of this e-course is to make bow making accessible and simple, and provide you with enough tools to put hatchet to stave, but is in no way complete.

Justin Sutera March 2016



Part III Choosing a Design and Making the Bow Blank

There are many things to consider when looking at bow design. Below I've outlined some of the more important things to look at and understand while choosing what your bow will look like.

Width vs. Depth of Wood

Wood is 8 times stronger in depth than it is in width. Here's a good way to picture it. If we have two wooden bows, each 40 lb., and we glue them side by side, we end up with an 80 lb. bow. If we take the bows and glue them back to belly, making a bow twice as thick, we get a bow that is 320 lb. However, don't think that you can simply make a really thick bow to increase poundagethe thickness of our bow is limited by that wood's ability to undergo compression. So that 320 lb. theoretical bow would actually break. The example is just to illustrate wood strength as it relates to width and thickness.

How Wide?

Well the width we choose for our bow needs to be informed by our desired draw weight and the density of the wood. In general, the heaver the draw weight, the wider we need to make the bow. First off, what is draw weight? Draw weight is the force (in lbs) required to pull your bow back to its desired draw length. Typically for a first bow you should go for 40 lbs. as a goal. Trying to make a 60 lb. bow, while maintaining efficiency, is tricky to do your first time. So what is a starting point? What informs our decisions moving forward? Well, experience will be the best teacher for you. However, I can give you some guidelines and things to look for to help you make informed decisions. Think of it like this: Compression on the belly is the primary force we are worried about with bow design. A bow is only as strong as its belly can compress. As we make a bow thicker, we are forcing the wood on the belly to compress further. So we are limited by how far the bow can compress. There is a point for each wood where as it is so stressed from compression it does not recover fully. This shows up as string follow. String follow will inform us during tillering about how thick our bow can be related to our desired draw weight. Bending a bow too much early on when it is still thick can permanently damage the wood, as it is forcing that belly wood to compress tremendously.

As a starting point, 1³/₄ inch is a good width to go for. We can always make it narrower later on, and this width will allow for a 40-50 lb. bow with any of the woods I've recommended.

Parallel vs. Pyramidal limbs

The limbs of our bow can take on many shapes and tapers. First off let's look at the leverage applied to different parts of the bow. Ever see a fishing rod? Notice how it tapers from thick at the handle towards thin at the tips. Imagine if that fishing rod was the same thickness its entire length. Where would it bend? It would bend (and probably break) by the handle, because that spot has the most leverage applied to it. We can think of a bow in the same fashion. The middle of a bow (the handle) has huge levers attached to it, applying force. Therefore the handle has to be very thick relative to the rest of the bow to resist bend. As we travel out from the handle towards the tips we experience less and less leverage. Out towards the tips of the bow there is actually very little leverage on that wood, and if we want that wood to bend evenly with the rest of the bow it has to be significantly thinner than, say, the mid limb of the bow.

So let's assume we want the entire limb of the bow to bend, except for the 3 inches at the tip. We can achieve this through a combination of tapers, both taking into account the width of the bow, and the thickness of the bow.

Without getting too bogged down with details, here are a few options. A pyramidal shaped bow starts out just above the fadeout as its widest point, and then tapers on a straight line to the tip. This design is great because the taper in width allows the bow to tiller evenly, and from that width design, the thickness of the bow can be uniform throughout. Obviously there will be adjustments to be made during tillering, but in general with a pyramid bow it simply has to be the same thickness throughout.

A parallel limbed bow has the limbs parallel for the majority of the limb until about 8-12 inches away from the tip where



Pyramidal taper (left) and parallel limb (right)

it tapers, sometimes dramatically, towards the nock. In this case the thickness of the bow must taper as well to account for the change in leverage as we move from the handle towards the tip of the bow.

One more principal which we will revisit during tillering is how to accomplish stiff tips. And on top of being stiff we want them to be light. Imagine the tips of your bow as levers to the arrow and string- stiff, light tips will help send an arrow nice and fast. If the tips bend too much, the bow can become "whip ended" which is an inefficient design. And if the tips are too heavy it can cause a lot of "handshock" in which your bow jolts you when you shoot. So how do we accomplish this? We are going to take advantage of the principal of wood strength in relation to depth. We can make our tips fairly narrow (<1/2 inch) as long as they are thick enough to resist bending. Usually this is subtle, though tremendously important.

A bow design to a seasoned bow maker is the intersection of the desired draw weight for the bow and the quality (density) of the wood being used.

An efficient 40 lb. bow made from hickory will look different than an efficient 40 lb. bow made from a less dense wood such as elm. What do I mean when I say efficient? Well there are measures of efficiency, and these are hand shock, arrow speed, and string follow. An efficient bow does not have string follow, does not have hand shock, and shoots a fast arrow. Draw weight does not always correlate with arrow speed. A high poundage bow may be terribly inefficient, and in that case the extra draw weight is simply wasted.

Laying out the bow

So with all that in mind, it's time to lay out the bow. You will need your stave, a pencil, measuring tape, and a straight edge. First, we must choose a length. I usually make my bows to about nose or eye height. Biometric measurements are very helpful when bow making, as this bow is being made exactly for YOU! Once you have a length it is time to find the exact middle. I like doing this by holding the bow horizontal in-between my hands and lining it up with my belly button. Ends up close to dead center every time

Mark the dead center, then mark 2 inches above and 2 inches below that line. Then mark another 2 inches above each of those lines. This is showing us where handle and fade-outs will be. Next we need to draw a center line on the back of the bow. If your stave is very straight, this can be done with a chalk line. However if your stave is not straight or you don't have access to a chalk



Showing the center marker of the stave at 4 inches, and the dotted lines indicating the handle and fadeouts 2 and 4 inches above and below the center





A view of the handle markings with the center line drawn as a dotted line the length of the bow

A view of the center line from the end of the stavenote it does not have to be perfect, just a reference



The shape of the handle drawn in- notice how between 2 and 4 inches away from the handle the bow flares out towards the width of the limb

line, you can draw your own center line in. Do this by making a dotted line the length of your stave, always splitting the width of the stave. This will, by nature, follow the grain. It doesn't have to be perfect, just a reference point.

Hatchet time!

Time to put hatchet to stave! Now that we have the back complete, and the design of the bow laid out, we can start removing wood to make a "bow blank". A bow blank is one step smaller than a stave. It still doesn't bend much, but it begins to take the shape of a bow. This entire time the bow has existed within the wood, it is just up to us to reveal the bow. A good friend and mentor once told me you simply make a bow by getting rid of all the wood that's not part of your bow! The truth is we will make a lot of wood chips during the bow making journey. And if done with intention, what is left behind will be a bow.

So here's the deal, we want to get closer to that bow that sits within the wood, but we don't want to go too far. One hatchet strike to deep, or into the back of the bow, and we may lose our bow. To a seasoned bowyer, they can see the bow in the wood when it is still a tree. So removing the wood that's not part of the bow is easy, because they have a clear picture of where the bow is. As a beginner it is harder to understand where the bow is within the wood. So as a result we have to remove wood more carefully and often slower with more control. I can rough out a bow blank with a hatchet in 20 minutes, but it's only because I know exactly how far to go. So be patient, and be with the process.



A view of the parallel limb and taper drawn onto the back of the stave.



Bow stave with handle and limbs drawn on, next to a roughed out bow blank, next to 2 finished bows

A hatchet is a fantastic wood working tool if used correctly. And it can quickly turn your bow into firewood if used carelessly. So read carefully, and proceed slowly. Maybe even practice on scrap wood first.

First, start off by holding your hatchet right under the head. Choking up on the tool will give you a lot more control. We do not want to chop into the wood and let the hatchet run with splits. We need to be more controlled than that. So what we'll do is make chop marks with the hatchet to break up the grain of the wood, and then go back along them shaving off the wood.

When chopping the sides, make sure they are perpendicular to the back and belly. When chopping the belly, make sure it is parallel to the back and perpendicular to the sides. It is important to keep the sides square, both as a reference and by way of maximizing compression ability.

Here is a principal that I hope you do not have to figure out the hard way: Always chop/carve away from mass! Chopping towards mass can result in splitting off a chunk of your bow. So for example, when chopping out the handle, always chop towards the center. This involves flipping the bow back and forth. When chopping your fadeout, chop from the handle towards the tip of the bow.

How thin should the bow be?

Definitely leave your handle thick, as we can work with that later. As far as the limbs go, you can safely chop to an inch thick throughout. You can definitely chop thinner, though this depends on your hatchet skills. If you are leaving huge tool marks and chopping unevenly I'd recommend switching to a more controlled tool sooner.

Where to chop?

When making a bow, or crafting in general, I like to say that we remove the wood that is least like the finished product. This means we are bringing the stave down towards a bow evenly. We don't finish one side before touching the other. Look at your bow as a whole, taking in the big picture. This will help inform you on where to take off wood.

You can start to get a feel for the thickness by floor tillering your bow. Whenever we bend a bow we must bend it as if it were being shot. This means only putting force on the handle and the tips. So with floor tillering, place one tip on the floor, one hand on the handle, and the other hand on the other tip. Ease your body weight into it and feel it bend. DO NOT OVER STRESS IT! If your bow isn't bending, don't force it. Once you feel your bow start to bend, don't go any further. We will continue with tillering next week!

For now focus on making your bow blank as even as possible. Your bow is only as strong as its thinnest spot. So if you went a little thin somewhere (in depth), make the rest of the bow match that thickness.

If you are sporadically working on your bow, make sure to keep storing it in your garage. However, you do need the wood to be mostly dry before going too far with tillering. When you have your bow at an inch thick or thinner, it is time to start drying it out more aggressively. I'd



Using a hatchet to break up the grain and then trim off wood from sides of the stave





Using a hatchet to bring the side of the bow towards the drawn line. Remember you are limited by your deepest tool marks- make sure none of your tool marks go within the lines of your bow.







Chopping towards the center of the handle from the fadeout



Flipping the bow over to chop the other side of the handle towards the center

suggest keeping your stave inside at the very least. A warm attic can be good, or near a woodstove can be a good place as well. Be mindful however, as your stave may warp and crack if it is dried too aggressively. A bow blank-size piece of wood will typically be dry enough for tillering within a few weeks just at room temperature. As always, if you have questions feel free to call us at the office and we'll be happy to help you along!

Hopefully you've got plenty to work on till next week. Good luck!



This allows us to safely chop out the handle without chopping off part of our limb



Profile view of a completed bow blank (bottom) next to a finished bow. Notice how the sides are perpendicular to the back and belly. Notice how the handle is thick and tapers rapidly towards bow thickness.



Proper floor tillering technique. Notice the tip on a solid surface (the floor), one hand on the handle and elbow braced on my hip, and the other hand on the tip. This bow blank is still very stiff and I'm not going to stress it by bending it too much.



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