Ash Flat Bow Making

As part of the Craft section of the Bushcraft Leadership course we were given the opportunity to make an Ash bow.

This document forms a pictorial tutorial of making an Ash Flatbow based on the Holmegaard bow found in Denmark in the 1940's. This bow is thought to be over 8000 years old.

Holmegaard bow

Source – Online Wikipedia

So what is a bow?

Basically it is a big wooden spring that accumulates, stores and releases energy to an arrow.

Types of Bow

Longbow – This type of bow is deep as it is wide and has a 'D' section profile. Traditionally Longbows in this country were made of Yew wood as this wood is very flexible.
This 'D' profile allowed the Bowers to produce more Longbows from one tree in comparison to making Flatbows.

Cross section of a longbow –

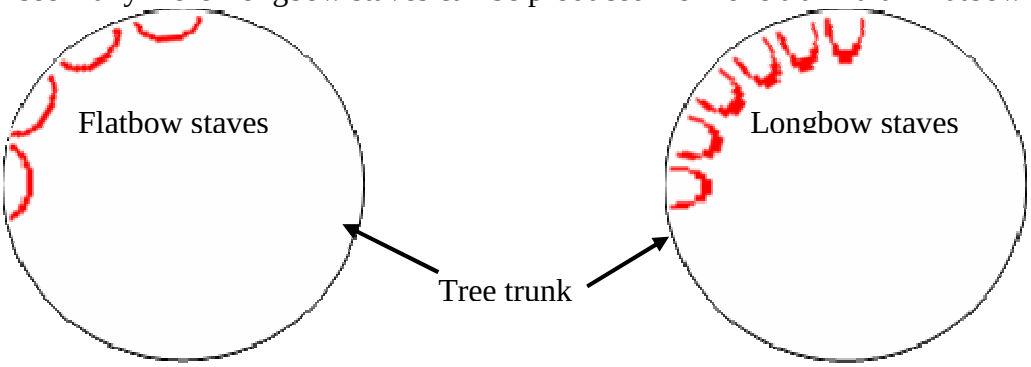
The width is generally the same as the depth.

Flatbow – This type of bow is wider than it is deep. This is a good design for carving when using Ash.
Ash wood is flexible and good for bows but only as a Flatbow as this style allows for more flexibility in the bow in comparison to the 'D' section profile.

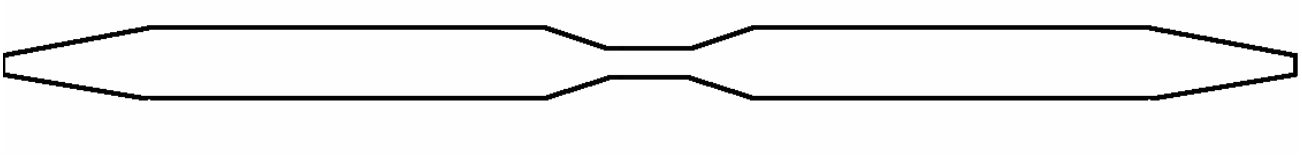
Cross section of a Flatbow -

The width is generally wider than it is deep.

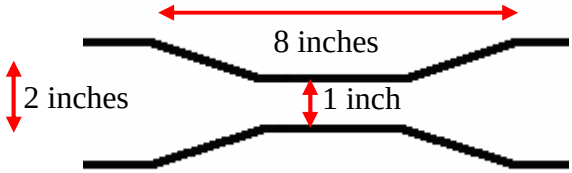
As you can see many more Longbow staves can be produced from one trunk than Flatbow staves.



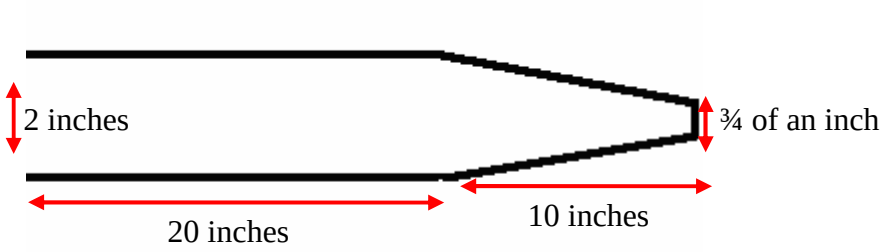
Top profile of the bow. The bow is 6 foot in length. All the drawings are not drawn to scale.



Zoomed in top profile of the bow handle.

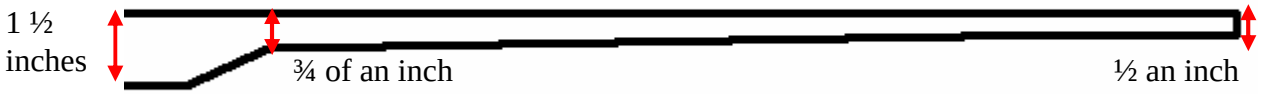


Zoomed in top profile of one limb.



Side profile of the bow

Side profile of the right limb prior to tillering



The production of the bow itself is covered in the following pages in the form of a pictorial tutorial.

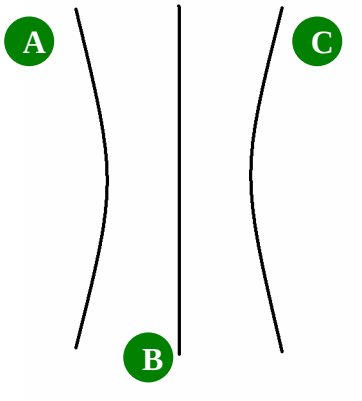
Some Bow terminology*

Back (of bow) - The face of the bow on the opposite side to the string
Belly (of bow) - The face of the bow on the same side as the string
Brace height - The distance between the deepest part of the grip and the string
Grip - The part of the bow held by the bow hand
Limbs - The upper and lower *working parts* of the bow, which come in a variety of different poundages
Nocking point - The place on the bowstring where the nock (end) of an arrow is fitted
Riser - The rigid centre section of a bow to which the limbs are attached
String - The cord that attaches to both limb tips and transforms stored energy from the limbs into kinetic energy in the arrow
Tab - A protection for the fingers that draw the string. Usually made of leather.
Tiller - The difference between the limb-string distances measured where the limbs are attached to the riser: usually the upper distance is slightly more than the bottom one, resulting in a *positive* tiller. Reflects the power-balance between both limbs.

*Source – Online Wikipedia

Before looking at the tutorial it would be good to look at some of factors that influence the energy going into a bow. All these factors are key to the final make up of the bow.

1. Bow profile – The profile that your bow retains will affect the amount of energy it can store.



A – Reflex profile. This stores far more energy than a straight bow but are not as accurate as a straight bow

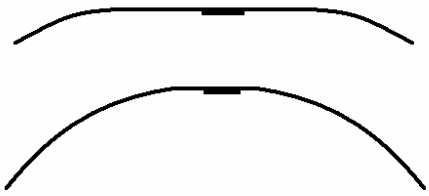
B – Straight bow. Less energy can be stored in the limbs but more accurate than a reflex profile

C – String follow/Set. The bow has retained its drawn profile and will store less energy than the straight or reflex bows.

2. **Draw length** – how far you can pull the string back

3. **Brace height** – the distance from the belly of the bow to the string.
    - The higher the brace height the more accurate your shot as the string paradoxes less (string bending around the bow) before it straightens itself after the shot. Paradoxing can cause the bow to judder as the string bends around the bow and can upset your shot as the arrow is released.
    - A low brace height means the limbs will come further forward and create more noise as you take your shot
    - A very high brace height can damage the bow as it puts the bow under higher strain
    - Also a high brace height can cause ‘string follow’ or ‘set’ where the bow does not flatten out when the string is removed but retains a curve. This means less energy is able to be stored in the bow prior to shooting.

4. **Whip Ending** – When carving your bow you need to be continually be aware of whip ending. This is normally where the middle area of the bow is too stiff and only the tips bend. You need to look for a nice curved profile as much as possible so that you can store the maximum but even amounts of energy in each limb.



Here the top bow is whip ended. The limbs are both too stiff when drawn resulting in less energy being stored in the limbs.
The lower bow has a more even spread of stored energy and are bending more evenly. Any stiffness should be retained just around the handle and in the tips of the limbs.

The following is a pictorial tutorial of creating an Ash Flatbow starting from felling the tree. The pictures of the tree felling are of me taking down a Sweet Chestnut tree but the principles are the same for felling the Ash used in my bow. The Ash felled for my bow was done by John Ryder using his chainsaw.

Tree Felling

The ideal Ash tree should have a section as straight as possible from the ground to about 7 feet with no side branches. This is the area you will cut the stave from.

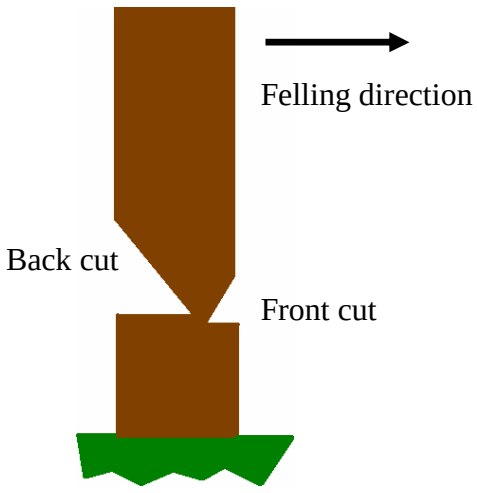
After selecting your tree and checking it is safe to fell the first thing to do is place a rope around the tree high up and secure it with a running bowline. The other end needs to be secured and tightened to another tree with a Truckers/Waggoners hitch so that it assists with the directional felling of the tree. This tree needs to be in the line of felling but far enough away that the tree being felled falls short of it.

A front cut is made at the base of the base of the trunk in the direction you wish to fell the tree.

The bottom of the cut is flat and the upper part of the cut is at 45 degrees.

On the other side another deeper cut is made just slightly above the front cut.

Pulling on the rope after the cuts had been made the tree fell within 1 metre of where I hoped it would fall.



After the tree was felled you could clearly make out the hinge created by the cuts made at the front and back.

The tree was then trimmed of all branches and the trunk cut into manageable sizes.

These pictures are of the Ash tree felled by John Ryder.

A line is scored in the bark down to the wood firstly. This helps with guiding the split of the log.

An axe is then driven into the scored lined to stat the split.

Note that the axe is at 90 degrees to the person hammering it in. This maintains a safe position for the worker.

The first axe is followed by a wedge and another axe to widen the split.

In this case the scored line helped greatly with controlling the split.

As other wedges are driven deeper into the split the previous ones can be removed to be used again.

An axe can also be used to cut the wood fibres not split by the wedges.

Once the log has been split once the process is repeated again and again until you have the staves you require.

Here are two staves ready for shaping.

Using a Draw knife I shaved of the bark of the stave.

I was very careful only to remove the outer and inner bark and not touch any of the wood.

The wood found just under the bark is the most flexible part of the bow and will form the back of the bow. Apart from light sanding this area of the bow will not be touched.

Using a string I marked out a centre line down the length of the stave.

Using the measurements shown at the beginning of the tutorial I then marked out the shape of the bow.

The first picture is the handle area and the other two are of the limbs.

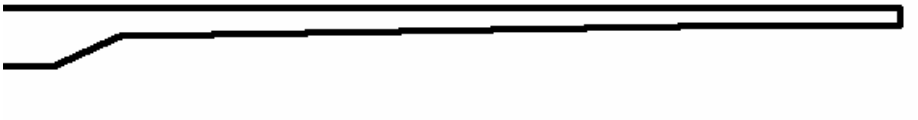
I then sawed stop cuts all along the stave. These cuts help when chopping out the excess wood.

As a piece of wood is cut out with the axe the stop cut stops a split running through the whole bow so that you only cut out the wood you want.

Here you can see the sop cuts. Also that I am using the axe in a safe and controlled manner. The bow is wedged against a tree and resting on a stump. The axe is in front of me and at 90 degrees away from my body.

Once the top profile is cut out the side profile needed to be cut out.

Using stop cuts again the stave was roughed out until I got the basic shape of the bow. The diagram below shows the shape of half of the bow. The dimensions are as laid out at the beginning of the tutorial.



At this point the bow was left to season for a month. One week in my garage and for three weeks in a cool spot in my house.

This allowed the wood to season enough to start the fine work.

Here the bow is clamped down for the fine work.

A clear picture of the bows rough profile.

To begin with I used a draw knife and then moved onto a spoke shave.

Having the bow clamped allowed me to use these tools safely and with precision.

For very fine shaving I used a cabinet scraper.

Up to this point I tested the bows flexibility by floor tillering it.

This involved pushing down on each limb to test their flexibility and compare the flexibility of each limb.

I was looking for an even flexibility in each limb.

I then carved out the Knocks on each limb using a round wood file.

The knock needed to be at an angle of 45 degrees and deep enough so that the string would not slip of.

Finally I sanded the Knock so that the edges would not abrade the string.

I just used some strong nylon string at first.

One end of the string is tied on with an overhand loop and the other end with a timber hitch.

At this stage the bow was not put under any tension by the string.

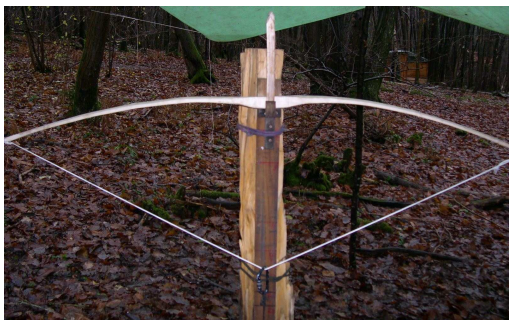
This was so that I could train the bow to bend in increments by using the upright tiller.

Putting the bow under too much tension would lead quite quickly to it snapping or cracking.

I then placed the bow on the tiller and in increments slowly bent it to view the curve on each limb.

The following pictures are of the bow during the tillering process. After viewing it each time I would return to the workbench to scrape wood from areas of stiffness using the cabinet scraper or spoke shave.

1



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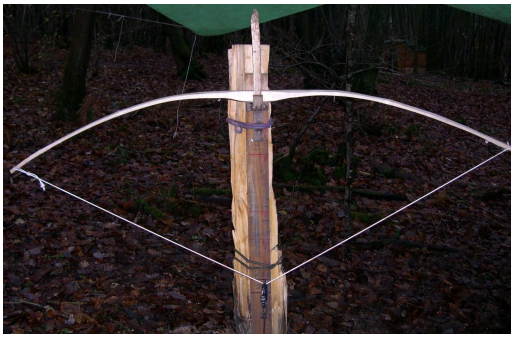
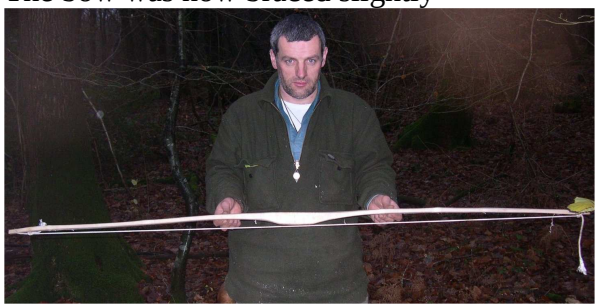


5 – The bow was now braced slightly



6

7 – A two inch brace

8

9 – Tillering by hand with a two inch brace

10 – Final brace about six inches

11 – Tillering now complete with evenly curved limbs

After a bit of tuition from Scott it was time to take my first shot and even managed to hit the target.



One that did not make it.

In this bow Charlie had developed a hinge in one limb that gave under tension.

I think he took it in his stride.

The next stage is to make the string for your bow.

Traditionally natural materials such as sinew, rawhide, plant fibres (nettle) or linen were used but modern materials were used for our bows. As modern string such as Dacron B-50 (50lb) is non biodegradable there is less chance of the string breaking so less chance of your bow breaking.

To make the string a plank is used with a clamp at either end. The clamps need to be placed apart 18 inches longer than your bow. Tie one end of the string to a clamp and run the string around the other clamp, then around the first one again. Keep doing this for five more cycles. Cut the string at each clamp and you should be left with two sets of five strings.

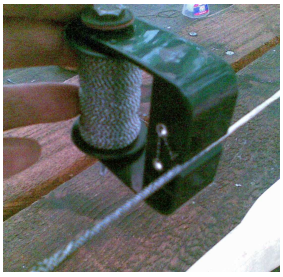
Cut here Cut here

The two sets of five strings need then to be woven together on one end to form a loop that will not come loose. The other end at this stage need only be tied together with an overhand knot.

Repeating the steps with the previous string the looped end is placed in one Knock and a Timber hitch on the other. When completed the bow is then braced again.

The string now needs to be Served in the centre of the bow where the arrow will be knocked.

The serving of the string is basically a whipping to keep the individual pieces of string that are loosely wrapped around each other together and provide a firm area to knock into your arrow. I also served the top of the string near my loop to stop it unraveling. After finishing serving the string I put some superglue at the end to keep it in place



The bow with the completed string.

Using various grades of sandpaper I sanded the bow down to get rid of any marks and sharp edges.

To protect the bow I then stained the wood slightly. Then applied a mixture of Boiled Linseed oil and white spirits (50/50 at first). After this had dried I reapplied more oil but with less white spirits each time until I just applied oil.

Lastly I glued on a small leather handle. I thought about stitching one on but felt it maybe too uncomfortable when holding it.

The completed bow.