A Most Versatile Tool

The ax is a wonderful tool. It can be used to fell standing trees, to buck them into logs, and to limb them once they are on the ground. Axes can be used for hewing logs square, or for splitting firewood or fence rails. The tasks they're suited for range from trail work and fire fighting to restoring historic buildings.

Before you lift an ax to admire it or work with it, you need to recognize its potential danger. An ax is a sharp wedge, normally applied with enough force to cut something. Whether that “something” is a log, your foot, or the person standing too close to you depends on your skill and concentration. By taking pride in your work, taking good care of your ax, and learning the correct techniques, you can avoid most of the danger of using an ax.

Master your ax instead of fearing it. You master ax work by practicing it. Chopping is an art. It takes years to become an expert. You can learn only so much by reading manuals and looking at illustrations; the rest you can learn only by swinging. Take a cautious, rather than aggressive, approach to chopping your first logs. Placement, control, proper stance, and technique are far more important than power. Only when you have become fully proficient does power become a consideration.

This chapter gives some basic instruction—and a few tricks of the trade—for using an ax for felling, limbing, bucking, splitting, and hewing. It also describes how to use an adz for log work. I’ve relied heavily on illustrations from one of my favorite books about axes, Woodsmanship, by Bernard S. Mason (1954). The wonderful illustrations are by Frederic H. Kock. Unfortunately, it is long out of print, but some of the illustrations are reproduced here by permission. We also used some good information from Fred C. Simmons’ Northeastern Loggers’ Handbook (1951).

Bear in mind that some of these historic illustrations do not reflect modern personal protective equipment, particularly hardhats and eye protection.

Using an Ax Safely

Personal protective equipment that you need for ax work varies with the job. Always wear good, stout leather boots, at least 8-inches high. Always wear safety glasses or goggles for eye protection. Hard hats are needed when there is any chance of being struck by something overhead. Hard hats are a must for tree-felling operations.

Some people wear gloves when using an ax, some don’t. Gloves are a good idea for splitting firewood, where you are handling many pieces of splintered wood. Leather gloves are always required while sharpening an ax. For chopping, use your judgment. If leather gloves protect your hands and help give you a good grip on the handle, wear them. I personally don’t wear gloves most of the time because I get a better purchase on the ax handle without them. The last thing I want to happen is for the ax to fly out of my hands on a swing. Then the person next to me really will need that hard hat!

It’s always a good idea to complete a job hazard analysis that identifies the safety concerns of the ax work you will be doing. In the Forest Service, a job hazard analysis is required. You must also describe the safety gear and procedures you need to follow to do the job safely. The job hazard analysis can save your life. Do it!

An ax is—or should be—a keen-edged tool. Be very afraid of a dull ax, because it is dangerous. It glances off a surface more easily (Figure 74). A blunt ax, improperly tapered, also has a tendency to glance off. An ax should always be kept razor sharp.

When an ax is transported in a vehicle or on a horse or mule, it always should be sheathed or boxed. A simple sheath made from leather will preserve the ax edge and possibly avert serious injury. It should also be sheathed while you are walking from place to place along the trail.
Always carry your sheathed single-bit ax at its point of balance near its head with the edge pointing down. The ax should be on your downhill side if you are walking on a slope. If you fall or trip, toss the ax away from you. Carry a double-bit ax at your side. Carrying an ax on your shoulder is asking for trouble, especially in the woods or on rough trails. Don’t do it.

Keep track of your ax. Be careful where and how you lay it down, and remember where it is. If you must leave your ax unsheathed, lay it flat with the edge toward a solid object like a log or a wall (Figure 75). Serious accidents are caused by stumbling over or falling on a carelessly placed ax.

For temporary safe storage, stick a single-bit ax in a log or a stump. Never lay it down flat out in the open. Never lean it up against a tree, a wall, or any other object where the edge is exposed. Don’t leave it stuck for long in a block of wood because it will rust. A double-bit ax should never be stuck in a log with one edge sticking out. Place your double-bit ax underneath a log lying flat or put one bit into a small piece of wood and then stick the other bit into a horizontal log. A sheath is better than any of these methods.
Here are a few more pointers on ax work:

- Do not chop directly through a knot if you can chop around it or chop the knot out. Knots often are very hard and can chip your ax or adz.

- Never strike the ground with your ax. If you need to cut roots, use a grubbing tool like a Pulaski or grub hoe. If you have to use an ax, use a "grubbing" ax that you don't care about abusing.

- Never try to drive a stake or wedge with the flat side of your double-bit ax. It is almost sure to crack the eye.

- Never use the poll of a single-bit ax for pounding steel wedges. The poll is there for counter balance to the bit. It is not there for pounding! The poll is not tempered properly to pound and will become deformed or chips of steel may fly off. A single-bit ax can be safely used to pound wooden or plastic wedges—that is all!

- The ax head is brittle at extremely cold temperatures. It is likely to chip unless it is warmed before using. One way to warm up your ax is to place it (sheathed of course) under your armpit, for a few minutes. Or warm it between your hands. If you don't want to share some of your body heat with your ax (which by now should be considered a family member), chop very slowly for at least 2 minutes in order to warm the ax up in the wood.

**Chopping Technique**

Chopping is an art. Start out loose and relaxed. Hold the ax with one hand fixed just above the swell at the end of the handle. On the up-stroke, the other hand slides up the handle close to the head. On the down-stroke, it slides back down the handle. At the point of impact, it is close to the lower hand. Each blow lands exactly where it is intended, with the proper force, and at the proper angle. There is no shock to the hands or shoulders. One corner of the ax blade should always be free of the wood, so that a slight twist brings out the chip and releases the bit without undue strain.

**Grip**—On an ax that is hung properly to fit you, place your left hand about 1 or 2 inches from the butt end of the handle or helve. Place your right hand about three-fourths of the way up the handle. This is the proper hold for a right-handed person (Figure 76).

![Figure 76—The proper ax hold for a right-handed person (drawing by Frederic H. Kock).](image)

**Forehand Swing**—This swing is used to cut the right side of a notch. These instructions are for right-handed choppers. Raise the ax over your right shoulder, your hands in the starting position (Figure 77). Swing the ax down on the log with a very natural swing motion, your right hand sliding down the handle toward your left hand at the bottom of the handle. You will end this motion with both hands at the end of the handle when the ax strikes the wood. Do not drive the ax straight into the wood, but instead cut on an angle about 45° to 50° from the edge of the log (Figure 78). Raise the ax again, slide the right hand up about three-fourths of the way on the handle and start your next swing. Continue this motion for the forehand swing. Your left hand never leaves the end of the handle.
Backhand Swing—The backhand swing is used to cut the left side of the notch (Figure 79). Bring the ax over the right shoulder as in the forehand swing, but shift your body well to the left so that the ax comes down more in line with the left side of the notch. This backhand swing is somewhat more difficult to master gracefully. Proper ax use always includes these two motions, the forehand swing and the backhand swing, always over the right shoulder for right-handed choppers. Changing hand positions instead of using or developing the back swing technique is not considered acceptable ax use.

Figure 77—Forehand swing (drawings by Frederic H. Kock).

Figure 78—Cut at a 45° angle to be most effective (drawing by Frederic H. Kock).

Figure 79—Backhand swing (drawings by Frederic H. Kock).
Using Axes

Figure 81—Three ways of gripping the ax for precise strokes: a) two-handed choke grip; b) one-handed choke grip and; c) one-handed grip (drawings from the Northeastern Loggers Handbook).

Accuracy is the only thing that counts; the force of the swing is not nearly as important as its placement. Chop with a series of strokes: the top, the bottom, and then the middle (Figure 80). If you chop in that order (top, bottom, middle) with both the forehand swing and the backhand swing, the chip will fly out after your last cut. On your last cut in the middle on the backhand swing, you should give a slight twist to the ax as you sink it into the wood to pop the chip out. Swing with a natural rhythmic and unforced motion. Always watch your aim. Leaving one edge of your ax blade exposed will help ensure it doesn’t get stuck in the log.

It is best to confine yourself to one grip and do all the chopping either right- or left-handed, whichever is your natural swing. In the long run, it is important to learn to chop well both right-handed and left-handed. Being ambidextrous can save a chopper a lot of trouble in everyday work in the woods, particularly in limbing.

Other grips besides the full-swing chopping grip are used for specific tasks (Figure 81). For careful and delicate work, such as sharpening stakes, notching house logs, or some limbing, use a two-handed choke grip, with both hands grasping the ax near the center of the handle. For cutting brush or sharpening wooden wedges, use a one-handed choke grip at the ax’s point of balance near the head. For splitting wood, cutting saplings, or sharpening stakes by yourself, use a one-handed grip, with your hand about halfway down the handle. Your spare hand should be nowhere near the ax blade during these operations!
Felling Trees

Felling is probably the most dangerous and difficult job in the woods. The USDA Forest Service has long required specialized training and certification before any of its employees are allowed to cut standing trees. This training is required whether chain saws, crosscut saws, or axes are used to fell the trees.

This description of felling with an ax is meant only to give the reader a generalized idea of the felling procedure. It should not be construed as a training guide. A faller needs to judge many variables—some deadly if misjudged—before attempting to cut down a tree. The information presented here is just a guide to help prevent some common mistakes. It focuses on ax techniques rather than felling techniques.

Never start chopping until you are sure there are no branches or brush in the way. An ax deflected by a small branch or twig can cause a serious accident. Be sure your fellow workers are in the clear.

Decide the direction in which you want the tree to fall, ideally with the natural lean of the tree. If not, you may have to use special techniques and equipment to offset the lean, techniques a novice should not try. Your ax can serve as a plumb to determine the tree's natural lean. To do so, hold the ax in your hand above your head at arm's length (Figure 82). Grip the very end of the handle with the ax head down. Use the ax as a plumb to sight around the tree from different positions as you walk a circle around the tree. Be sure to take into account the crown mass, which side the branches are on, and whether there is more weight on one side or the other.

Consider wind direction. A slight breeze on the ground can be more powerful at the top of a 60- to 100-foot tree. Wind can change the direction of fall with unpredictable results. Heed the warning of an old country-western song by Sonny James: Don't Cut Timber on a Windy Day. Decide the direction you will need to move the log after it is down on the ground. Try to drop the tree in a clearing, if possible.

After you have determined where the tree is going to fall, gently swing your ax handle fully extended over your head in a 360° arc to make sure there are no obstructions (Figure 83). Walk around the tree at arm's length with the ax fully extended to make sure that there are no branches within this circumference. Clear the underbrush for an escape path at about a 45° angle to the direction of the planned tree fall. The route should be clear of all vines, branches, and rocks—anything that you might trip over. Never stand directly behind the tree as it falls or during your escape. If the tree kicks back, or if the tree slabs and splits, the back portion will kick straight back.

“Widow makers” are another danger. These are usually dead branches in the tree you're felling or in neighboring trees that might be knocked down by the tree you are cutting. You should
always wear personal protective gear during these operations. Hard hats and safety glasses are a must.

Make sure your footing is secure and stable. Chop only when you are well clear of other people. Stand with your weight evenly distributed with both feet planted about shoulder width apart. Check the distance to stand from the cut before you start to swing. Start swinging with a very gentle easy motion in order to gauge your distance and your power stroke.

The first cut will be the front notch or the undercut in the direction of the planned fall (Figure 84). This notch should be about one-third to one-half of the diameter of the tree when felling strictly with an ax. If a crosscut saw is used in combination with the ax, the front notch should be no more than one-third of the diameter of the tree.

Use your ax as a sight guide to determine if the notch is in the proper direction of the fall (Figure 85). A double-bit ax is best for this purpose as it makes a perfect T-square. Place the head of the double-bit ax in the front notch that you have just cut, with the handle pointing directly in the planned direction of the fall. If the handle does not point in the planned direction of the fall, you must re-chop the notch until the handle points in the right direction.
Using Axes

Figure 85—Using a double-bit ax as a T-square to indicate the direction of fall.

Now begin the back cut, or the final felling cut, on the opposite side of your front notch. The back notch should be a minimum of 2 inches higher on the stump than the front notch. The back notch is cut to within about 2 inches of the tip of the V on your front notch (Figure 86). Never cut completely through the back notch to the front notch.

Remember the rule when placing your cuts to create a notch—near, far, and middle to remove each chip. Always place the front notch and the back notch as low on the tree as possible while standing safely and comfortably. As the back notch gets deeper, closing in on the 2 remaining inches of hinge wood, keep glancing toward the top of the tree. The tree will start moving there first, allowing you to detect whether the tree is going to fall in the planned direction. A gust of wind blowing opposite the planned direction of fall can get you into serious trouble at this point.

Cutting through the hinge wood is the single most dangerous thing a novice faller can do. Never cut through the hinge wood! If you do, you will have absolutely no control over the direction the tree will fall, and it could very well fall on you.

When the top of the tree starts to move in the direction of fall, move a few yards back away from the tree at an angle (Figure 87): never move directly behind the tree or in front of the fall! Keep your eye on the top of the tree while making your escape. You should get as far from the tree as possible. Keep your eye on the tree long enough to make sure not only of its direction of fall, but to look for widow makers that can be thrown back in your direction. As the tree is going down, continue to look overhead. You are only safe once the tree and broken limbs are on the ground.

Figure 86—Back notch or the final felling cut.

Figure 87—Plan and clear escape routes at an angle away from the planned direction of fall.
Limbing

After the tree is on the ground, the next step is removing its branches, called limbing. Start at the butt of the log and work toward the top, cutting on the underside of the branches (Figure 88). Always limb from the opposite side of the log with the log separating you from the ax. Limbing is a dangerous operation because of the chance of glancing blows (Figure 89) when the ax does not dig into the wood.

You need to pay attention to branches that are under compression, those that bear the weight of the log. When the limb is cut, the limb may spring free, striking you. The log can also roll.

Limbing is like other chopping in most ways. The same grips on the ax handle are used and the swing is the same. Much of the ax work, however, is performed in constricted, awkward positions. Some branches are large, others small. You need good judgment to place the right amount of force behind each swing of the ax.

The danger of accidents from an ax that has been deflected by branches is much greater than with clear chopping. One important precaution is to clear interfering branches.
Using Axes

before attempting to chop a large limb. If the log is so large that you cannot reach over it to limb, chop the top branches off first. Stand on top of the tree trunk to chop the side branches. Cut each limb flush with the trunk; leave no stobs or pig ears.

The inexperienced chopper should do very little limbing while standing on the log. Experienced choppers with sure control of the ax will be able to work safely in the more hazardous positions.

For large limbs, particularly on hardwoods, it is often necessary to cut a notch similar to that used in cutting down a tree (Figure 90). Cut from the lower side of the limb, as always, and keep the bottom of the notch even with the

trunk surface. The vertical side of the notch should slope somewhat with the angle of the limb. Often a larger notch is easier to cut than a smaller one. The downward cut is made with the grain of the wood and not directly across it.

A word should be said about hemlock knots. These knots are very hard, especially on dead limbs. It is sometimes better to break off small limbs with the poll of the ax than to try to chop them. It is easy to take a huge nick out of the ax bit by swinging too hard at right angles to a hemlock limb. This is more likely to happen in cold weather, when the ax is more brittle. In such cases, warm the ax bit before using it on such limbs. If possible, use an ax with a blunter taper than you would for ordinary chopping. As a final precaution, chop lightly at an angle to, or with, the grain, and do not attempt to twist out the chips.

Cutting Pinned-Down Saplings

A dangerous job that goes along with limbing is cutting off bowed-over saplings (spring poles), whose tops have been pinned down by the fallen tree. Never cut them by giving either the top or the butt a whack with the ax from the outside. They can spring out like a catapult, with a force that can easily break a jaw or arm. The trick is to cut the bowed-over tree from the inside. If this is impossible, give the strained fibers on the outside a light touch with the ax to partially release the strain before fully severing the sapling.

Bucking

Bucking means cutting a tree into log lengths or firewood bolts once it is on the ground. Often it is also necessary to buck logs that have fallen across trails. Most bucking is done with the saw, but there is nothing wrong with using an ax for this job. A good chopper can often

A good suggestion from Ian Barlow, trails and wilderness expert on the Nez Perce National Forest:

No matter how hard you try to avoid it, sometimes you have to limb on the same side of the log that you are standing on. When that happens, a good rule of thumb is to never let your ax handle or your ax head drop below the level of your hands while you're chopping. If you never let your ax head break a plane that's parallel with the ground, you can't cut your feet.

Figure 90—Cutting off a large limb.
buck a log in the same time it takes to set up a crosscut saw and use it to cut a log.

The beginning chopper should stand on the ground to the side of the log. Make sure you have firm footing. Take a wide stance and chop between your feet, turning your body in the direction of the ax stroke as you cut first one side of the notch, then the other. Again, keeping the handle parallel with the ground will prevent foot injuries.

For an experienced ax user, the proper position for bucking is to stand directly on top of the log and chop halfway through one side. Turn around and chop halfway through the other side to finish the cut. These two V-notches will meet right in the middle of the log (Figure 91).

The advantages of chopping two V-notches in a log instead of one large V-notch is simply a matter of ease of chopping. Chopping two smaller V-notches is easier and takes less time than cutting one large notch.

How wide should you cut your V-notch? The most common mistake is to make the V-notch too small (Figure 92). This pinches the middle of the V-notch before you reach the center of the log. You will quickly find that chips will not clear from a notch that is too wide. If a very large log is bucked, you need to make your notch narrow and then widen it out; the chips won't clear if you start the notch much wider than 10 to 12 inches.
On a large log you increase the size of the notch by chopping out one side. Always remember your high, low, and middle technique for placing ax blows. Make three forehand swings, high, low, and middle, followed by three backhand swings. If you are standing on the log, your first swing should strike high at the top of the log; the second at the bottom of log; and the third right in the middle. If you follow any other sequence, the ax will stick in the wood. The last stroke, stroke number six, throws the chip on the ground (see Figure 80).

**Splitting**

The wood to be split is cut into stove lengths that can be anywhere from 12 to 24 inches long. Stand the wood on end, either on the ground or on a chopping block, if the wood has been cut straight with a chain saw or crosscut saw. If the ends are uneven, the wood needs to be placed in a crotch of a downed tree to hold it upright (Figure 93).

You should have a designated splitting ax. Its blade should have a much steeper angle than a felling and bucking ax. Take advantage of existing cracks or checks in the wood to help direct your first blow, because the first split is generally the most difficult. Swing straight down toward the top of the block. Use your body weight, with your knees snapping into position just as you hit the block of wood. Give the ax handle a slight twist just as the bit hits the block (Figure 94). This throws the block of wood apart and prevents the ax from sticking. The real secret of splitting wood with an ax is in this little twist right at the end of the stroke.

**Figure 93**—Safe and unsafe techniques for splitting wood (drawings by Frederic H. Kock).
Figure 94—Twist the ax head as it enters the wood to keep it from sticking (drawing by Frederic H. Kock).

On a knotty, gnarly block of wood you'll need to start your split from the outside edges and slab off the sides. Inevitably, your ax will become stuck in the block you are trying to split. The best way to remove it without damaging the ax is to rap the end of the handle sharply downward with the palm of your hand without holding the handle.

Hewing

Hewing is shaping a log with an ax or an adz. The primary tools are the single-bit ax and the hewing or broad ax. The single-bit ax is used for scoring, a process of chopping cuts perpendicular to the length of the log down to a chalk line marked on the log. This line marks the edge where you want the flat, hewn surface.

Follow the scoring process with broad ax hewing. An adz is sometimes used for the final dressing of the hewn log. Hewing can convert a round log from the woods into a square timber or a partially squared timber called a cant. Hewing doesn't work well on dry logs, so hew green, freshly cut logs. Here is a summary of the steps to follow:

1. Remove the bark from the log using a drawknife (Figure 95), bark spud (Figure 96), or possibly your single-bit ax. Place the log crossways on two other short sections of log that have a V-notch chopped in them to cradle the log. The log to be hewn should be placed in these V-notched cross sections, called yokes, at a height that is comfortable to hew. The position should be about knee high or a little bit higher.

Figure 95—Removing bark from a green log with a drawknife.

Figure 96—Using a bark spud.

Place wood chips, a wood slab, or an old board on the ground underneath the log to keep the broad ax from digging into dirt and rocks. Clamp the log to the yokes with log dogs, big iron staples driven into both the yoke and the log at both ends (Figure 97). This keeps the log from moving from its proper position.
2. Using a level or a plumb bob (Figure 98), scribe a vertical line on the small end of the log to mark the depth to which you want to hew. Then, to make sure the log is large enough, measure out the final end dimensions of the cant or beam you wish to create. Scribe this layout on the small end of the log first, because it is more difficult to fit it there than on the large end of the log.

3. Now move to the large or butt end of the log and repeat the process of scribing the end dimensions of the beam or cant.

4. Snap a chalk line from the upper corner of the layout on one end to the corresponding corner on the other end (Figure 99). It is easier to do if you first cut a notch in the log with your pocket knife immediately above the scribed vertical line. Drive a nail into the vertical line just deep enough to hold one end of the chalk line. Run the chalk line up through the notch and along the length of the log (Figure 100). Then, holding the line tightly at the other end, snap the line by raising it straight up and letting it go.
5. Next, score the log. To start scoring with your single-bit ax, stand on top of the log. Chop to the depth of the chalk line in the center, or for a large-diameter log, take chops high, low, and in the middle. Do not burst (clear) the chips. Each of these swings is done with the forehand swing only. This process is called slash scoring. It is the most common method of scoring. The slashes are placed 3 to 4 inches apart down the length of the log.

On a large log, scoring is easier using a method called “juggling” (Figure 101). In juggling, you score the log by chopping a series of shallow V-notches to the depth of the chalk line. To do this, stand on top of the log and cut with both the forehand swing and the backhand swing. Then, still working from the top of the log with your single-bit ax, chop parallel to the log with the grain to split off the chips between the V-notches (spaced 10 to 12 inches apart, Figure 102).
6. Hewing with the broad ax is the next step (Figure 103). In a right-handed swing, your left hand should be on the end of the broad ax handle, with your right hand holding the handle near the ax head. Standing on the ground, spread your legs apart so they are out of harm’s way, and swing straight down toward the ground. Follow the chalk line, breaking the remaining wood between the scoring slashes, or between the V-notches left from juggling.

If a chip of wood gets stuck to the ax bit, which often happens while hewing, stop and remove the chip carefully from the ax blade. A chip stuck to the bit of the ax will guarantee a glancing blow when you begin your next cut.

After scoring and hewing the first side of the log, move the log dogs one at time so the log does not shift off plumb. The opposite side of the log is then freed up but is still held in a plumb position. Repeat the scoring and hewing process on the opposite side of the log. At this point the log is flat on two sides. Generally only two sides of the log were hewn in cabin building, the exterior and the interior walls. If you want to hew all four sides, you will need to rotate the log 90° and repeat the process on the remaining two sides.

7. Use an adz to give a more finished appearance to the hewn log. The traditional method of using the adz is to roll the log 90° so the hewn side is face up. Stand on top of the hewn face and cut directly toward your toes. As you might imagine, this can be a dangerous operation for someone who is unskilled. The adz needs to be razor sharp to cut well. The utmost concentration is needed to swing the adz with enough power for it to do its job but not enough to slice your toes (Figure 104). On small logs, you sometimes can straddle the log and swing the adz between your legs (Figure 105).
Historic log buildings often display the tooling marks of ax and adz work, best seen on the interior walls. It is often possible to tell if the hewer was right- or left-handed by the position of the scoring marks and the broad ax marks. There is also a great difference between the tooling marks left by a broad ax and those left by an adz.

Figure 105—You may be able to straddle a small log when using an adz (drawing by Frederic H. Kock).
Using Axes