

## Chapter 11—Using an Ax

The ax head is a cutting tool and the handle is the delivery mechanism. An ax in motion is powerful and can be dangerous. Before chopping, ensure that the ax is in good condition and that the work area is clear of other people and objects. While serious accidents are rare, it is best not to chop wood alone. Some national forests actually prohibit employees from chopping alone.

This manual provides an overview of basic chopping techniques and proper chopping ergonomics, but it is not an instruction guide about chopping. To chop safely and efficiently, seek hands-on training from an experienced axman.

Sizing up a log or tree is actually more complex than many people realize. You must understand the mechanics of chopping. Every cutting scenario is different. Remember, for every action there is an opposite but equal reaction. Unless a log is in a neutral position (i.e., lying flat on flat ground), the wood fibers you cut will either be under tension or under compression. As shown in figure 11–1, wood fibers under compression are pushing together and will close in when cut (possibly binding your ax), whereas wood fibers under tension are stretching and will separate when cut (sometimes with great force).

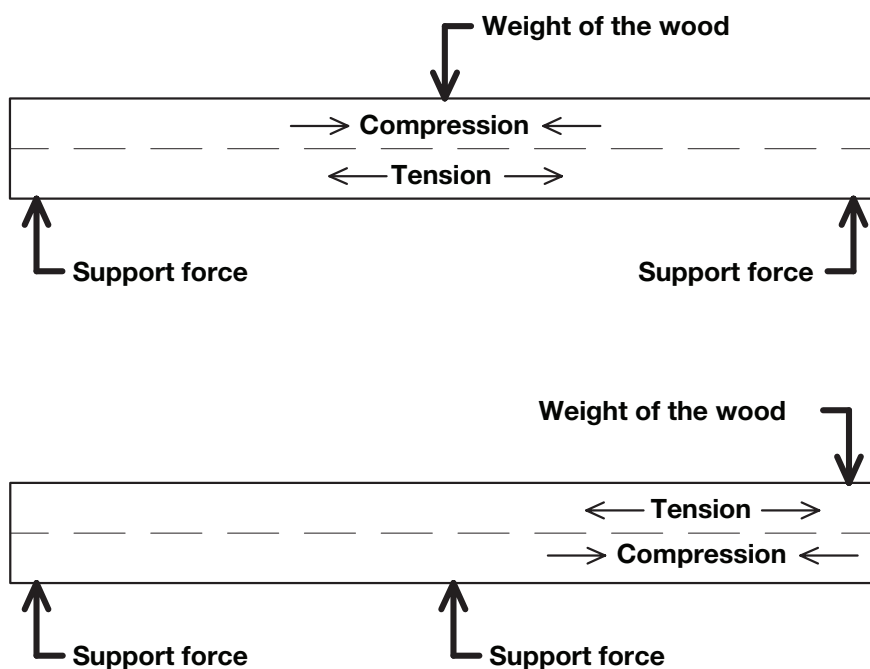


Figure 11–1—Compression and tension in a log supported on either end and in a log supported on one end.



Various types of binds can contribute to the forces you must consider (figure 11-2). These forces can vary, but gravity is one constant force that you must always take into account. A log or tree can reach its breaking point quickly and with considerable force.

What may be intuitive for experienced axmen may not be obvious to novice or inexperienced axmen. This is why hands-on training and mentoring are so important for novice axmen.

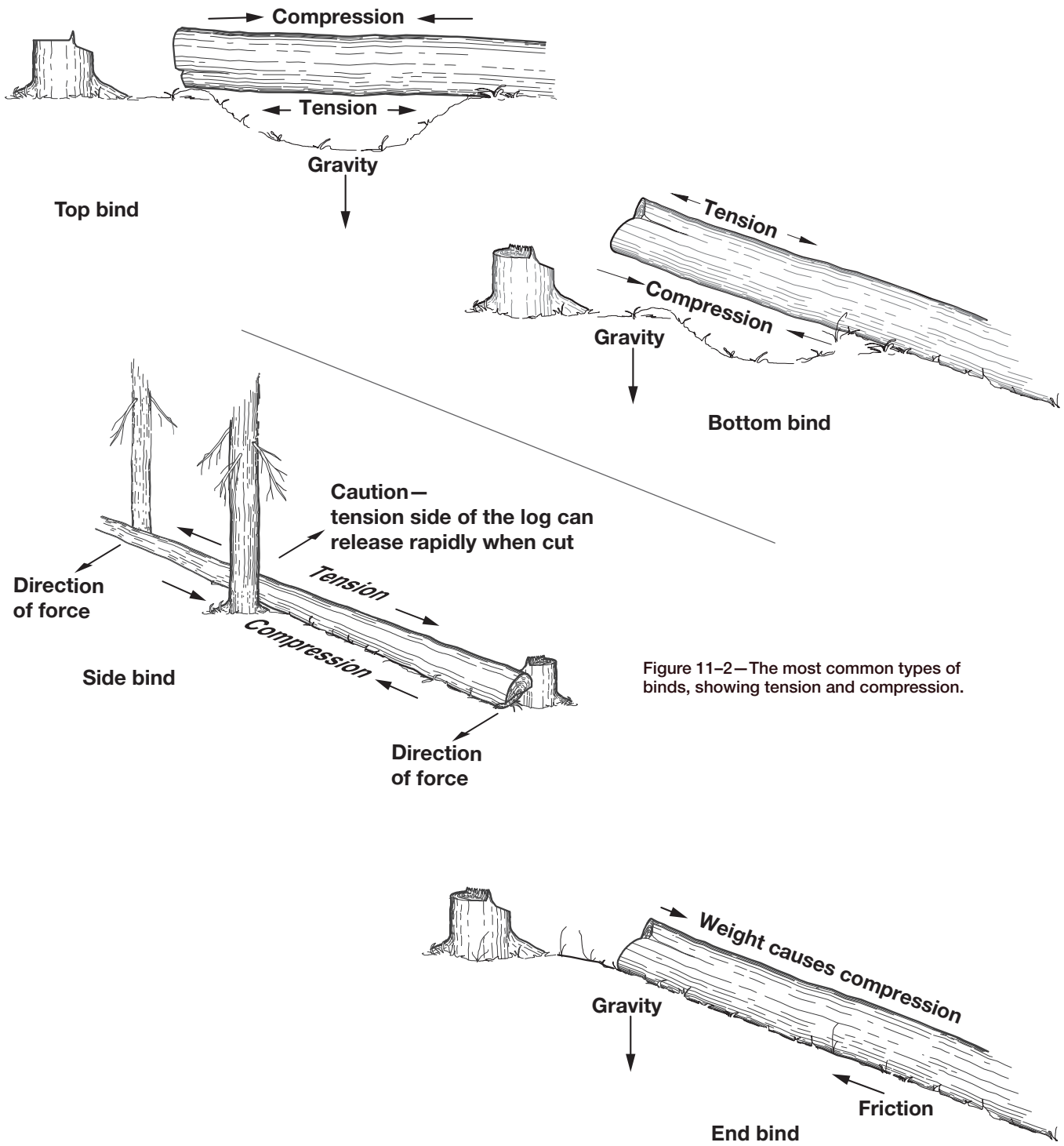
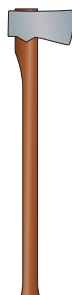


Figure 11-2—The most common types of binds, showing tension and compression.



The publication “[Saws that Sing: A Guide to Using Crosscut Saws](http://www.fs.fed.us/t-d/php/library_card.php?p_num=0423%202822P)” (0423–2822P–MTDC) <[http://www.fs.fed.us/t-d/php/library\\_card.php?p\\_num=0423%202822P](http://www.fs.fed.us/t-d/php/library_card.php?p_num=0423%202822P)> (figure 11–3) contains a section called “Preparation for Bucking and Felling” that provides detailed information about situational awareness and hazards to look for when sizing up a cutting area.

Instructors for the Forest Service use the “[Chain Saw and Crosscut Saw Training Course](https://www.fs.fed.us/t-d/php/library_card.php?p_num=0667%202C01)” (0667–2C01–MTDC) <[https://www.fs.fed.us/t-d/php/library\\_card.php?p\\_num=0667%202C01](https://www.fs.fed.us/t-d/php/library_card.php?p_num=0667%202C01)> (figure 11–4) to teach sawyers to use crosscut saws. The instructors then certify the sawyers after this training.



*The ax forgets what the tree remembers.*

*—African proverb*

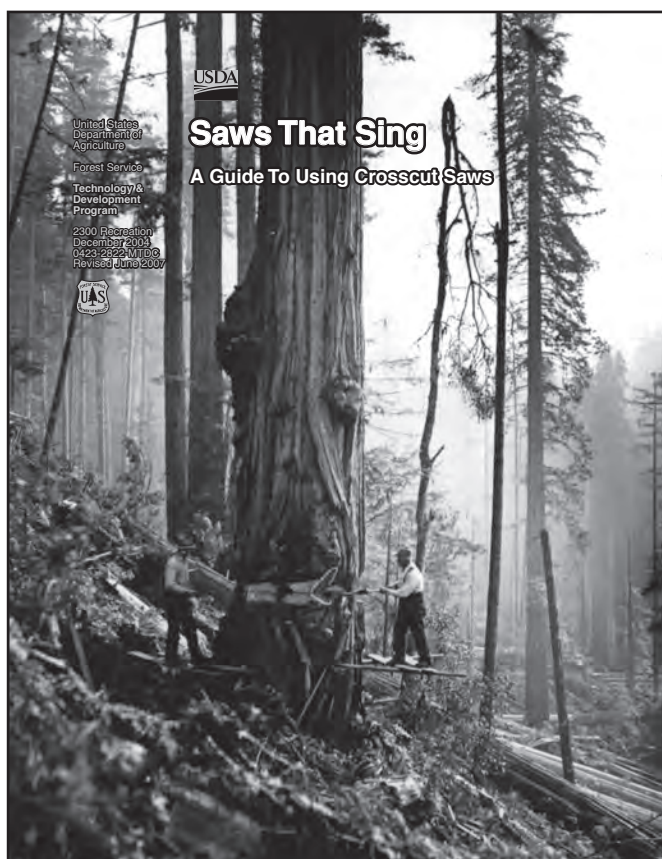


Figure 11–3—The publication “Saws That Sing: A Guide to Using Crosscut Saws.”

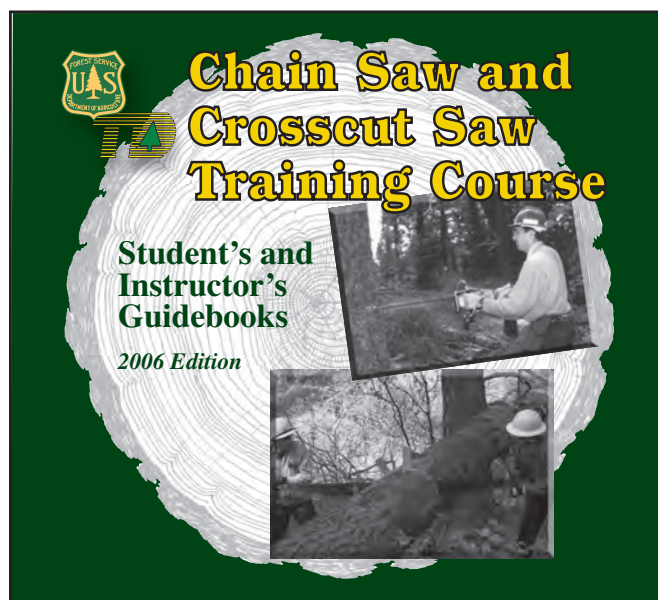


Figure 11–4—The “Chain Saw and Crosscut Saw Training Course.”



## Basic Ax Safety

As with every job in the Forest Service, the assignment begins with a safety review and a job hazard analysis (JHA) or risk assessment (RA). Review the worksite and identify safety concerns and hazards. Discuss them with your crew and ensure that everybody understands them.

Personal protective equipment (PPE) for Forest Service employees handling an ax in the field should

include a pair of good quality leather workboots with at least an 8-inch top. The Forest Service requires employees in the field to wear hardhats and eye protection. Some people may choose to wear gloves while chopping, but gloves are optional. In some situations, wearing gloves may actually be dangerous; they may become slick when working in rain or other wet conditions, and you could lose control of your ax while chopping.

### Chainmail Socks

Competition chopping requires competitors to wear chainmail socks (figure 11-5). These socks protect the competitor's feet and lower legs in case of an ax strike. Some forest crews also use chainmail socks to protect their feet and legs.



Figure 11-5—Chainmail socks.



### Short Pants and High Heels

Loggers frequently cut the bottom hem off each leg (referred to as “staged off”) of their work pants. They sometimes cut off several inches, so that the bottom of the work pants end at the middle or top of their boots (figure 11–6). This is actually an important safety measure. Shorter pants are less likely to catch brush or branches that could trip the logger. Removing the hem also allows the pants to rip rather than to catch on the stub of a broken branch, which could cause the logger to stumble and fall. Whether you are chopping or sawing, staged off pants are a good option for working in areas with tripping hazards.

Boots comprise another important piece of equipment for working in the woods. Leather boots with lug soles and at least an 8-inch top provide appropriate ankle support and foot protection. A tall heel, typically 2 inches, helps provide stability and balance for working on hillsides.

Another option is to wear boots with calked (also known as caulked) or hobnail soles. These types of boots are widely known as corks, or corked boots. The short metal studs on calked soles provide stability and gripping power, especially in wet conditions or when standing on a log. Corked boots are commonplace in the logging industry. They are appropriate for the woods, but not for paved or concrete surfaces. They can be slippery on pavement, which also wears out the hobnails quickly. Wearing corked boots indoors can damage floors. A logger who wears corked boots indoors generally slips the boots into sandals (figure 11–7) made from a piece of wood with a leather or firehose strap.



Figure 11–6—“Staged off” pants and boots with heels.



Figure 11–7—Corked boots and logger sandals.



## Handling an Ax

Ax safety begins with transporting the tool to the field. You have many hours invested in sharpening and hanging your ax, so you do not want to damage it before you even reach the worksite. When transporting the ax to the field, cover it in a sheath or, preferably, store it in a box. The idea is to protect yourself and the cutting edge of the ax. Use a good quality leather or mill felt sheath (figure 11–8). If necessary, you can make a temporary sheath out of a section of firehose, but you shouldn't use this sheath

for long-term storage; the firehose can trap moisture against the blade and cause rust. Do not use duct tape; the residue sticks to the ax blade and transfers to the wood, adding friction when you cut.

While walking to the site, carry the ax where it balances comfortably in your hand. This should be close to where the ax head and handle meet. Carry the ax on the downhill side of the path so you can easily throw it aside if you stumble or fall (figure 11–9).



Figure 11–8—A variety of axes covered in different types of sheaths.



Figure 11–9—Carrying an ax on the downhill side of a slope.



Sheath the ax whenever possible, particularly a double-bit ax, which always has one cutting edge pointing toward you. **Never carry an unsheathed ax over your shoulder.** At times, you may have to carry an ax on a backpack—always be sure to sheath and properly secure it.

When you are not using your ax, place it in a safe location where it will not be damaged and where it does not pose a danger to anyone in the area (figure 11-10). You should sheath the ax if you can. If you can't, place it where everyone can easily see it. Do not stick a double-bit ax into a log and leave one

edge exposed. If you are unable to sheath a double-bit ax, lay it flat on the ground with the head next to the log. Remember, you are responsible for the safety of your ax, yourself, and the people around you.

Another safety concern is how to hand an ax to another person. Hand an ax to someone with the blade turned away from both of you. As you hand over the ax, ensure that the other person has a firm grip before you release it. The practice in the Forest Service is for the person receiving the ax to acknowledge it by saying “got it,” or some similar statement.

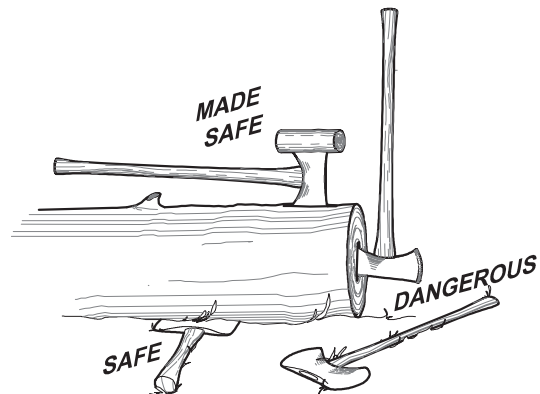
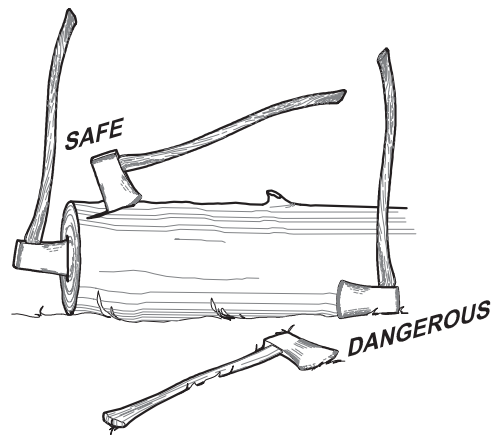
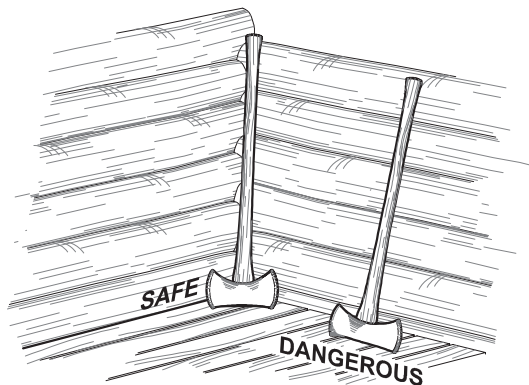
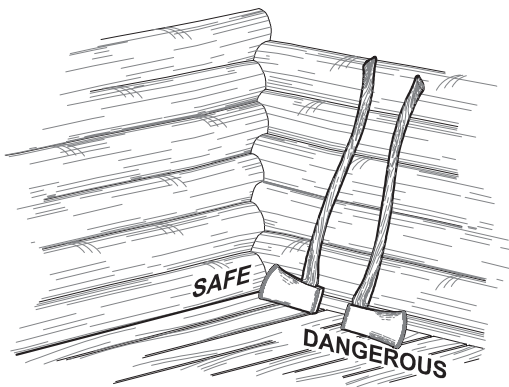
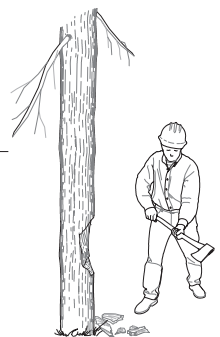


Figure 11-10—Place your ax in a safe location when you're not using it. This not only protects the people in the area, but also prevents damage to the ax.



## Using the Forest Service Cutting Process Hazards and Obstacles

To maintain your safety, use the Forest Service's five-step cutting process (known as "OHLEC") for felling, bucking, limbing, and brushing. Incorporate this process into every cutting scenario you undertake. The five steps are:

- **O**—Determine your objective
- **H**—Identify hazards and obstacles
- **L**—Identify leans and binds
- **E**—Identify escape paths
- **C**—Develop a cutting plan

### Objective

Regardless of the task, determine where you want the cut wood to end up. Some examples include:

- If felling, plan the most desirable placement or lay for the tree.
- If bucking, plan where you want the bucked log.
- If limbing, determine the sequence and direction in which to cut large branches so they do not fall on you or the next branch you intend to cut.
- If brushing, particularly in thick brush, plan how to remove the brush after you cut it.

Identify hazards and obstacles. Some examples of what to watch for include:

- Overhead dangers (fire, rotten tree tops, widow makers, loose bark)
- The wood itself (fire, rot and hinge wood integrity, hollow trees/logs, saw length compared with the tree diameter, bees, poisonous plants)
- Spring poles
- Buildings, equipment, or other trees you do not want to damage
- Control of the cutting area
- Other people

Clear any hazards from the area where you will chop to ensure that you have good footing and a firm stance. Remove any branches or limbs that could trip you and clear an escape path that you can use if the tree or log unexpectedly moves or shifts toward you while cutting. Remember, the tree or log may be under a variety of forces that could cause it to move rapidly when you sever it.

Next, clear the area where you will swing the ax. Pay particular attention to the area of your backswing. You should be able to swing your ax in a 360-degree arc around you if the area is clear (figure 11-11). Clear away everything that is in the arc of your swing. Even small branches or twigs can deflect a blow, making a potential accident or injury more likely.





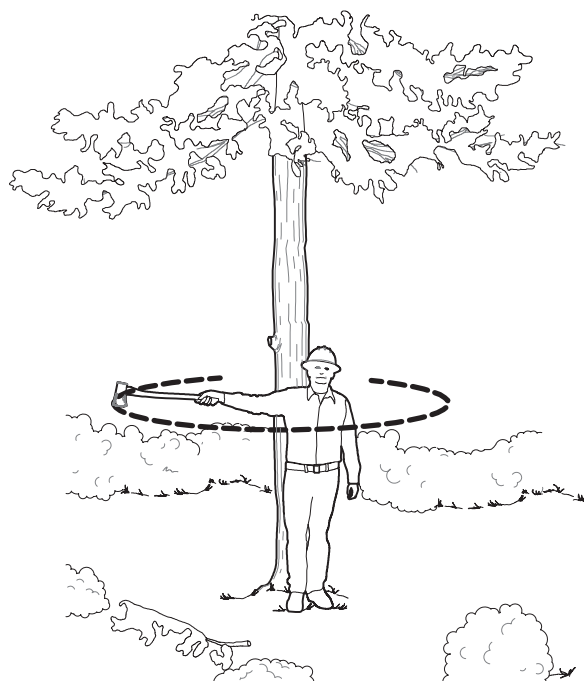
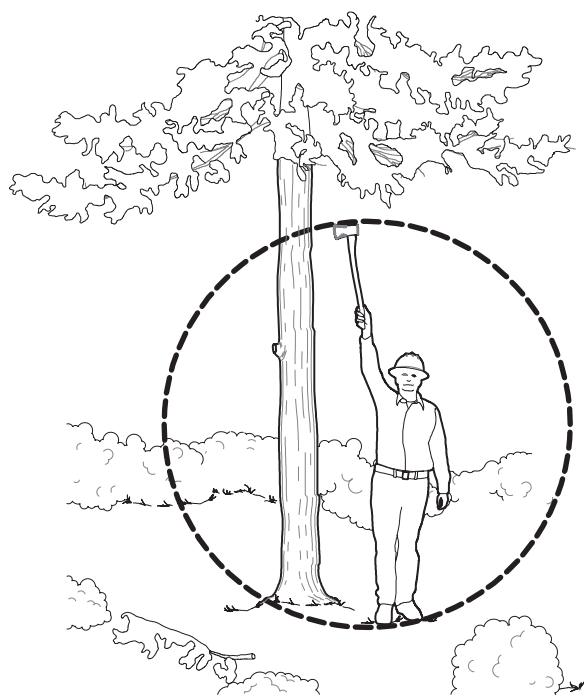


Figure 11-11—Checking to ensure an area is clear before beginning to chop.

## Leans and Binds

To identify the forces acting on the tree or log you plan to cut, you should:

- Determine the lean of a standing tree. Does it have front lean or back lean? How much side lean does the tree have, and in what direction?
- Determine binds in logs, spring poles, limbs, or brush.

## Escape Paths

After you determine leans and binds, you should:

- Determine the safe and unsafe side of the tree, log, spring pole, limb, or brush.
- Choose and clear an escape path (or two paths, if necessary). The path(s) should lead diagonally away from the base of the tree, but should not be directly behind or in front of your objective (where you want the tree to fall). Your escape path(s) should take you a safe distance from the tree, or to a place of cover.

## Cutting Plans

Cutting plans vary with every tree or log. Develop a cutting plan of techniques to use when removing wood fiber, including:

- Face-notch construction type (conventional, Humboldt, or open face)
- Hinge position, length of hinge, width of hinge, and amount of stump shot needed
- Back cut type (straight in from the back or angled in from the sides)
- Wedge placement, the number of wedges, and the placement of the ax

When working with a sawyer, you must also account for communication between crewmembers, the swamper, or the crosscut saw partner.



## The Mechanics of Chopping

The following three sections (“Chopping Styles,” “Felling Trees,” and “Splitting Wood,”) explain how to cut wood.

### Chopping and Splitting

There is a difference between chopping and splitting wood. When chopping, the ax chops at an angle across the grain of the wood. When splitting, the ax chops in line with the grain of the wood.

Other chopping techniques not discussed here are worth exploring but, for safety reasons, it is best to learn these through experience and practice, and not from a manual.

When it comes to chopping wood, some basic principles hold true. Understanding how the cutting edge of an ax and the shape of an ax head facilitate cutting and splitting wood makes you a safer and more efficient axman.

Remember, an ax must do three things:

- Cut or sever wood fibers
- Displace the wood chip after the fibers are severed
- Release from the wood

Cutting wood is a complex process that involves the three stages above, which occur almost simultaneously.

The profile of an ax head and the angle at which the ax head strikes combine to displace wood chips. The grain structure and presence (or absence) of knots are factors that determine the density of the wood. Whether the wood is green, dry, solid, or rotten also plays a part in determining density. All of the aforementioned factors, along with the leveraging and pivoting action of the handle, help determine whether the ax head releases from the wood.

### Wood Fibers and Lignin

A piece of wood is really a bundle of individual cellulose fibers held together by lignin, which acts as a glue. Think of the wood fibers as a series of individual straws held tightly together. In hardwood species the fibers are densely packed. In softwood species the fibers are less densely packed. The lignin that holds the fibers together is less dense than the fibers and creates an avenue for splits in the wood to propagate.



The angle at which an ax enters wood is extremely important. Whether you chop vertically or horizontally, a 45-degree chopping angle is best for an ax to sever fibers, displace a wood chip, and safely release from the wood. If you chop at too steep an angle, directly against the grain of the wood, the ax only severs the top few layers of wood fibers before the compressed wood stops the ax's forward movement. Chopping at too steep an angle prevents a wood chip from breaking free. The ax severs fibers if you chop at an angle shallower than 45 degrees, but the ax head may slice or glance off the log, creating a dangerous situation. A strike at 45 degrees sinks the cutting edge safely into the log until it no longer severs, tears, or compresses fibers. Figure 11–12 shows the diagonal strike of an ax and illustrates what happens when the force of the ax strike exceeds the strength of the lignin, forming a split in line with the grain.

When people refer to the use of an ax, they call it chopping. However, the term “chopping” may not be completely accurate. An ax used properly actually slices and chops.

As an example, consider cutting a piece of fruit or a vegetable. If you chop an apple or tomato with a knife, the knife either sinks in and sticks or bounces off, depending on the sharpness of the knife, the density of the apple or tomato, and the amount of force you use. If you cut with a knife, starting at the heel and drawing it across to the tip, the knife slices rather than “smashes” its way through the apple or tomato. An ax blade should work the same way. Even though you use a chopping motion with the ax, it should slice through the wood fibers, similar to the way a knife slices through apple or tomato fibers. Just as a sharp knife does a better job of cutting through an apple or tomato, a sharp ax does a better job of cutting through wood fibers. Both an ax and a knife work best when you incorporate a slicing motion, where the cutting edge moves through a little at a time rather than all at once. The cutting edge initiates the cut and then the rest of the blade moves through (figure 11–13). The curved shape of the ax's cutting edge facilitates this slicing action.

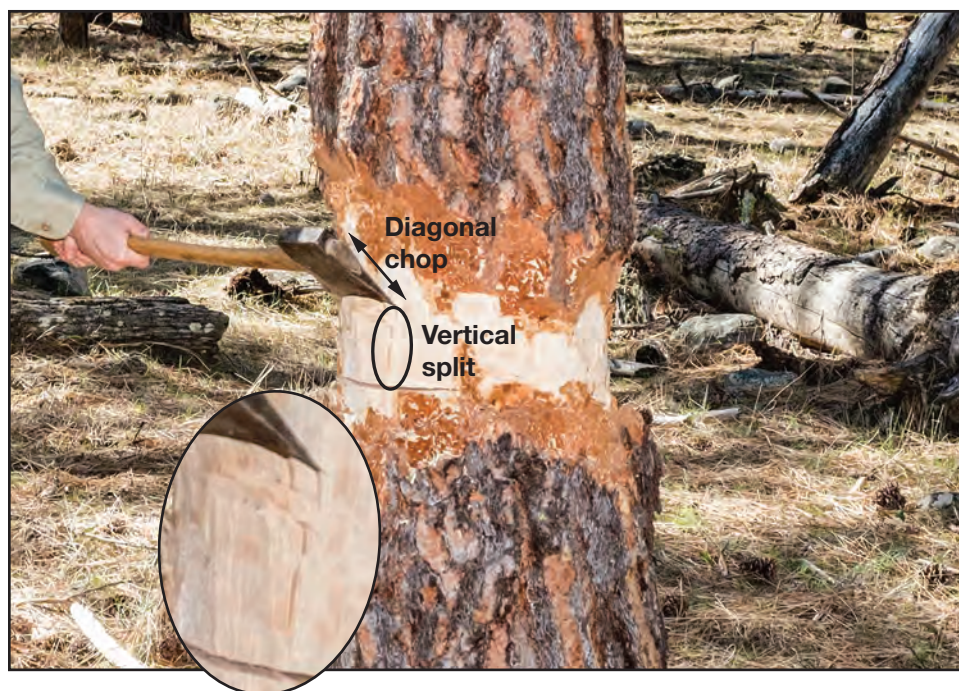


Figure 11–12—The initial chop of an ax forms a diagonal cut and a vertical split at the end of the cut. The inset shows a closeup of the ax blade embedded in the diagonal cut and the resulting vertical split.

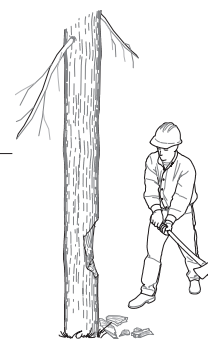




Figure 11–13—The arrows in this picture indicate how the cutting edge of an ax head slices through and severs wood fibers and how the driving force helps to pop out the wood chip.

Think of an ax blade as a wedge. The thicker the blade, the greater the displacement force for removing chips (figure 11–14). Of course, penetrating wood with a thicker blade requires more energy. Conversely, the thinner a blade, the less energy it requires to penetrate wood, but the less wood it displaces. Because a thinner blade penetrates deeper without displacing a wood chip, it encounters more friction and requires more effort to release. In other words, an improperly shaped ax head does not release easily from the wood because friction and the compressed wood fibers hold the head in place.



Figure 11–14—An ax blade penetrating deep enough into wood to cause wedging action and to displace wood chips. Note the size of the wood chips; they indicate a well shaped ax and proper chopping technique.



## The Physics of Chopping

The concepts of energy, work, and fracture mechanics explain how chopping severs wood fibers and dislodges wood chips.

When you raise an ax to strike wood, you generate potential energy. When you swing the ax, the potential energy becomes kinetic energy. Upon impact with the wood, the kinetic energy becomes “work,” which is defined as force multiplied by the distance the impacted object moves. The force at the cutting edge of an ax generates a critical stress that causes crack initiation in the wood. Note that stress is equal to force divided by area; therefore a smaller area impacted by a constant force results in higher stresses. Consequently, a sharper ax will achieve the necessary critical stress for crack initiation faster than a dull ax.

As an ax head plunges into the wood in line with a crack, the sides of the ax head generate a wedging force against the wood (figure 11–15). When the stresses induced by the wedging force exceed the fracture strength of the wood, the wood fibers fracture and a wood chip releases.

Proper chopping technique with the ax handle facilitates and can enhance the slicing action of the ax cutting edge, efficiently severing fibers and causing crack initiation in the wood. Just as importantly, the handle acts as a lever that helps to dislodge the wood chip and provides a pivoting mechanism to release the ax from the wood if a wood chip does not dislodge.

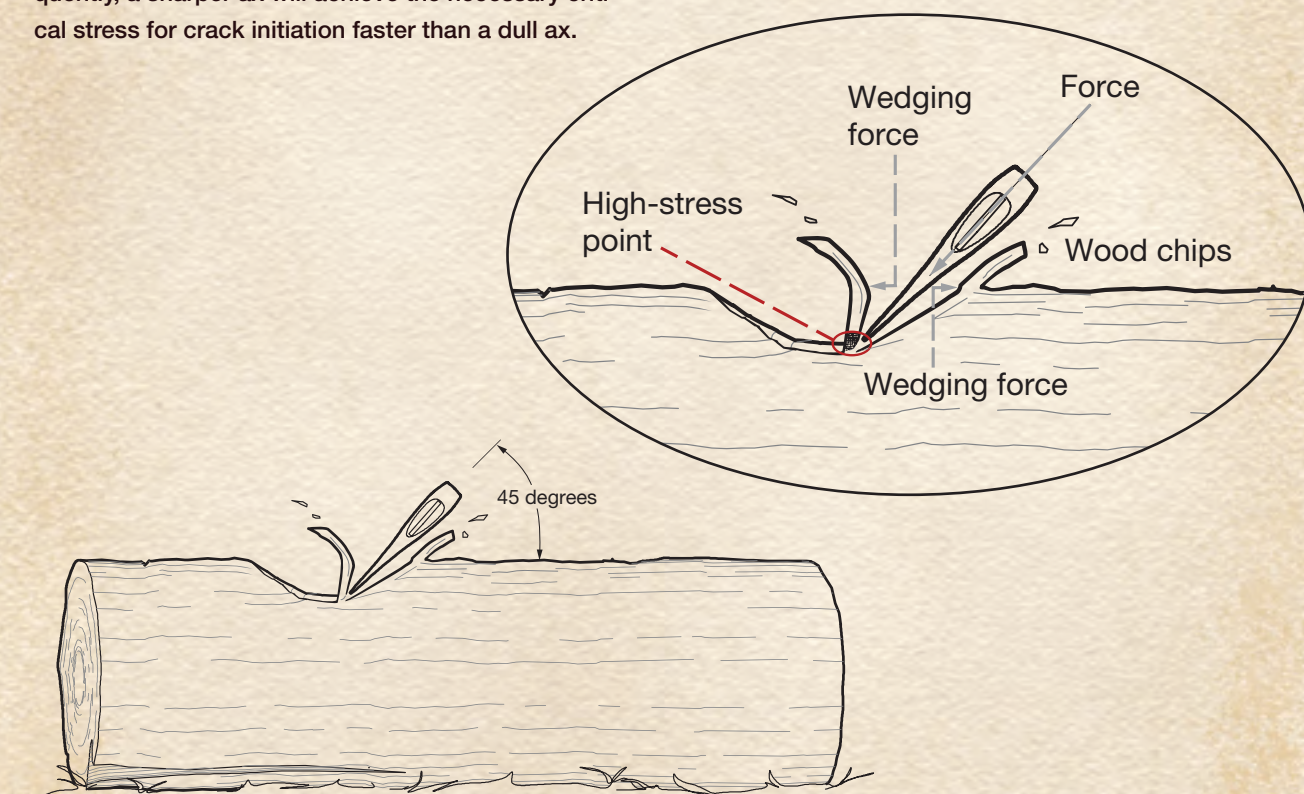


Figure 11–15—An ax head chopping at a 45-degree angle, severing wood fibers and releasing wood chips. A closeup view (inset) of the driving force of the ax head, the wedging force to either side of the ax head, and a high-stress point at the cutting edge of the ax head where the wood chips release.



## Chopping Styles

There are two basic chopping styles: swinging over your shoulder or raising the ax directly over your head before beginning your downward swing. Use the over-the-shoulder style for felling or bucking and the overhead style for chopping logs lying horizontally. Base your preferred style on your comfort level and the types of chopping you do. The publication “[An Ax to Grind: A Practical Ax Manual](https://www.fs.fed.us/t-d/php/library_card.php?p_num=9923%202823P)” (9923–2823P–MTDC) <[https://www.fs.fed.us/t-d/php/library\\_card.php?p\\_num=9923%202823P](https://www.fs.fed.us/t-d/php/library_card.php?p_num=9923%202823P)> explains the over-the-shoulder style, which the Forest Service has taught for years. The Forest Service did not teach the overhead style until recently.

The overhead style works best for chopping horizontal logs because the power for swinging an ax is located in the center of the body. So, as you swing an ax down toward the wood, the overhead style delivers the most efficient and powerful chop. It is also the most accurate style because you are looking directly down at the wood you chop. However, if the terrain prevents you from safely positioning your body for the overhead swing, the over-the-shoulder style may work better.

The overhead style does not work when felling a tree. When felling a tree, you use the over-the-shoulder style. Though called “over the shoulder,” this style uses both an over-the-shoulder, downward swing and an upward, “under-the-shoulder” swing. To master the use of an ax, you must master both the overhead and over-the-shoulder chopping styles.

Whether you chop from overhead or over the shoulder (figure 11–16), everyone has a dominant side. It is important to be able to chop either left or right handed, even though most people choose to use one side when chopping. While you may prefer to chop left or right handed, knowing how to chop from

either side has its benefits. At some point, every ax-man confronts a situation where the angle of the tree, slope of the hillside, or other natural feature prevents chopping from his or her dominant or preferred side. Chopping limbs off a downed log is a common scenario where the ability to switch hands will make chopping both easier and safer.

Regardless of which chopping style you use, accuracy is more important than power. Practice accuracy and gradually add more power to your strokes. You can use a simple exercise to improve your hand-to-eye coordination when chopping:

- Identify a spot on a log and use the over-the-shoulder and overhead styles to try to strike that exact spot with the ax as many times as you can.
- Focus on a specific spot to help improve precision and accuracy.
- Aim directly between your arms when using the overhead style.

For this exercise, you are not chopping to remove chips and there is no power behind your stroke. You are just trying to hit the same spot as many times as you can.

### Planar Motion

Whether you chop from overhead or over the shoulder, it is important to remember that proper chopping requires you to move the ax in two dimensions (called a “planar motion”). You should move the ax like a hammer, along the same line from the top of the swing until the head hits the wood. Some choppers mistakenly swing the ax in an arc, particularly when chopping over the shoulder. This improper form leads to inaccuracy.



Figure 11-16—Chopping from overhead (right) and chopping from over the shoulder (below).



## Basic Chopping Styles—Over the Shoulder

You can learn basic chopping styles in a short time, but these same styles take years to master.

Chopping is a series of fluid movements, much like a dance. If necessary, take a few moments to warm up and stretch before you begin to chop so that your muscles are loose and relaxed.

Begin chopping by taking the ax in both hands. Place one hand on the throat of the handle, which is slightly above the swell of the knob (figure 11-17). Position the other hand on the shoulder, which is just beneath the



Figure 11-17—Holding an ax with one hand on the throat and the other hand on the shoulder.

ax head. Keep the hand on the throat fixed and the hand on the shoulder loose so that the hand on the shoulder slides down the handle on the downward stroke, meeting the fixed hand. Reverse this motion on the upstroke, sliding the loose hand back up the handle to the shoulder (figure 11-18). While the fixed hand always stays on the throat of the handle, the sliding hand may not reach all the way to the shoulder. The length of the handle and of your arm determine where your sliding hand lies. Overreaching with your loose hand could change your stance and affect your balance, safety, accuracy, and ergonomics.

Maintain the ax at a 45-degree angle when striking a log lying horizontally in front of you. A properly sharpened ax easily sinks into a log at 45 degrees. Strike at too steep an angle and the ax does not properly penetrate the wood. Strike at too shallow an angle and the ax could scoop or glance off the log. Many axmen flick or twist their wrists as the ax strikes the log. This motion helps dislodge the wood chip and prevents the ax from sticking in the wood. Be aware that flicking or twisting your wrist could reduce power to your stroke and also puts sidewise torque on the ax handle. If the chip does not release, this technique

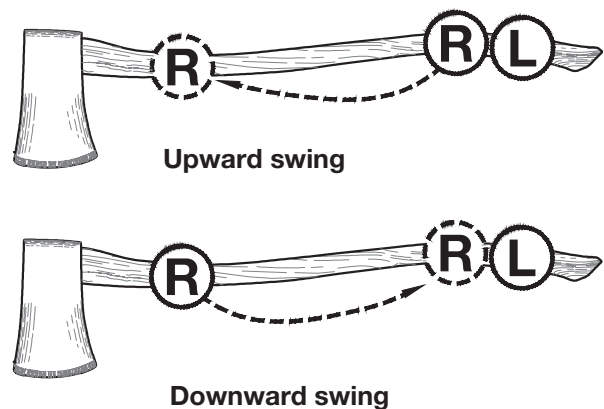


Figure 11-18—Proper hand placement for upward and downward swings.





could crack or break the handle, especially if the wood grain in the handle has cross grain or runout grain (see figure 6–16).

Another method to help release a wood chip is to snap your hands and wrists as the ax strikes the log. This snapping motion provides better penetration and extra wedging power at just the right moment to help pop the wood chip free. If you are a novice axman, focus on accuracy and develop your basic ax skills before incorporating new techniques into your work.

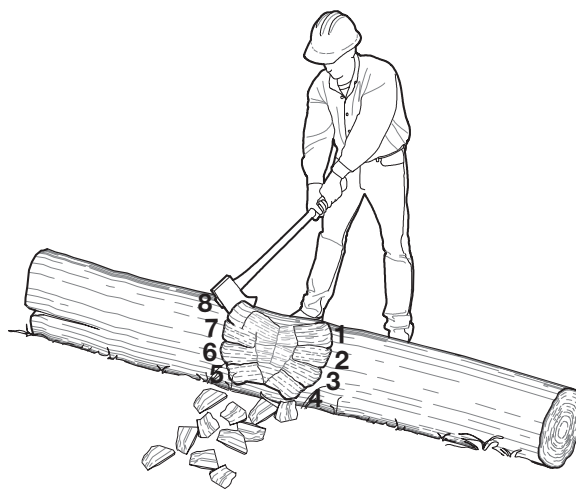
When chopping a log lying horizontally, make sure to start with a wide enough cut. If you chop the log on both sides, each V-shaped notch will be about equal

to the diameter of the log. When chopping the sides of the log, make your cuts to remove chips from the top portion of the log before chopping the bottom portion of the log. Because the log is cylindrical, the bottom is not visible as you start to cut. Clearing chips from the top portion of the log enables you to see the bottom portion clearly (figure 11–19), and reduces the chance that you will strike the ground with your ax. When you can see the bottom portion of the log clearly, you can cut more easily in a circular pattern from top to bottom.

For more information about chopping patterns, refer to the “Chopping Patterns” section later in this chapter.



Figure 11–19—Chopping in either sequence shown will clear chips from the top portion of the log, making the bottom portion visible and reducing the chance of striking the ground with the ax.



If you chop the log from only one side or from the top down, make the cut twice the diameter of the log (figure 11–20). The notch becomes narrower as you cut through the log. If you make the notch too narrow when you begin the cut (figure 11–21), the

resulting angle will be too steep, making it difficult to remove chips farther down into the log. If necessary, make the notch wider. Do not continue to cut into a narrow notch.



Figure 11–20—When chopping from only one side of a log, make sure to cut the notch twice the diameter of the log.



Figure 11–21—This notch is too narrow to continue removing big chips; it must be wider to enable the ax to cut through to the bottom of the log.



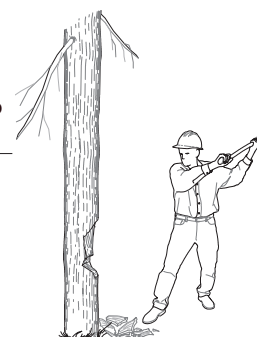
An excellent technique for making a wider notch is to chop two notches close to each other and then use the ax to remove the center portion along the grain (figure 11–22). You can also simply rechop one or

both sides of a narrow notch to make it wider (figure 11–23).



Figure 11–22—Using a horizontal chop to remove the center section between two notches; this is more efficient on larger logs.

Figure 11–23—Rechopping the side of a notch to widen it; this is more efficient on smaller logs.



Look for knots while you decide where to cut. Extremely hard knots can damage the cutting edge of an ax, especially if the ax blade is thin. If a knot lies within a cut, be sure to work around it (figure 11–24).

Figure 11–24—Cutting around a knot in a log.



### Basic Chopping Styles—Overhead

Your body and feet should face a log when you chop it. Square your hips with your shoulders so that your body aligns with the log as you swing the ax. After you cut one side, shift your body position to align with your ax stroke as you cut the other side (figure 11–25). Do not just turn your upper body; move your feet and upper body together to keep them aligned. Misaligning your body can lead to scooping or glancing blows, reducing the power of your stroke and your accuracy, and increasing your fatigue.

With your feet and shoulders aligned, raise the ax straight up over your head with your wrists and ax at a 90-degree angle—this is the proper position for striking. The ax should not point straight up, nor should it be so far back that the eye points toward the ground.

While standing up straight with the ax in the proper overhead position, tuck in the elbow of the arm

holding the throat of the ax handle so that it aligns with your nose. As you follow through with the stroke, this position keeps your ax and arm aligned with your body and with the point that you strike. Another way to think of this is to keep your nose aligned with the back of the ax head on the downward stroke. As you begin your downward stroke, try to keep your wrist at a 90-degree angle through the natural arc of the stroke. Add power to the stroke by snapping your wrists just before the ax contacts the log.

Many novice axmen have a bad habit of looking off to the side or around the ax to gauge accuracy. To prevent this, envision resting your chin on the center of your chest during the downward stroke. If you align your body correctly from your feet through your hips and shoulders, you will raise the ax properly and follow through to cut on your mark, preventing a glancing blow that might injure you.



Along with aligning your body properly, another way to avoid cutting yourself while chopping is to bend your knees slightly as the ax strikes the log. With your knees bent, the ax is never aligned with your legs and will fall to the side if you strike a glancing blow. Bending your knees works best on smaller logs, when you are chopping closer to the ground. Larger logs provide a greater margin for error; a glancing blow is more likely to strike wood instead of your shins. However, bending your knees does take

some power away from your stroke. Experienced axmen snap their knees straight just as the ax strikes the log, adding more power to the stroke.

This technique only works when you chop vertically from over your head or shoulder down onto a log. When you chop horizontally, you must position your feet so that the ax strikes far enough in front of you that it cannot contact you.

Figure 11-25—Squaring the shoulders and hips in line with the ax stroke. Note that the axman in these pictures has turned his body to be in line with his chop.



The length of the ax handle (figure 11–26) also plays a significant role in chopping safely. The longer the handle, the farther the blade is from your body. The farther the blade is from you while you chop, the less likely you are to cut yourself. A few inches of handle can be the difference between striking your shin and striking the ground. However, there are tradeoffs to consider when choosing handle length. The longer the handle, the more you need to practice for accuracy. The better your accuracy, the less chance you

will deliver a glancing or scooping blow. This is an example of why you need to practice and develop your skill as you find the handle length that works best for you.

You should use a choked grip (figure 11–27) when cutting brush or other thin material in tight spaces. Because of the close proximity, you grip the ax close to the ax head and make small, tight, controlled chops.



Figure 11–26—Various sizes of ax handle, ranging from 26 inches to 44 inches.



Figure 11–27—A choked grip makes it easier to cut brush, though there may be other tools that are more appropriate for the job, such as lopping shears or a small pruning saw.



If the object you chop requires some stability to keep from moving, but allows you to keep your hand far enough away from the cut, you can use a one-handed swing (figure 11–28). This cut is common for small saplings. For a one-handed swing, you hold the ax around the middle of the handle and hold the object with your hand out of the strike zone. Holding the sapling has two benefits: you stabilize the trunk so it does not bend when you strike it, and you apply tension to the trunk, which adds stress to the fibers and makes them easier to sever. Holding the ax in the middle of the handle allows a fuller swing than a one-handed, choked grip. Try to maintain a 45-degree cutting angle.

When using these modified chopping techniques, pay careful attention to where you place your hands and feet. When chopping in tight spaces, you may not have enough room to swing, or may have to kneel instead of standing. Identify the risks before beginning to chop and adjust your technique to prevent injury.



Figure 11–28—Using a one-handed swing to cut a small sapling.



Remember, you may be able to use tools other than an ax to more easily cut small brush and saplings (figure 11-29).



Figure 11-29—Using a Swede ax to cut a dead sapling.

### Chopping During Cold Weather

Regardless of the type of chopping you do, be mindful of your ax when you work in cold weather. Cold steel is brittle and can easily chip or break. Do not chop knots or frozen wood with a cold ax. If possible, warm your ax before chopping. A simple way to do this is to tuck the ax head under your arm inside your coat (figure 11-30). Alternatively, chop slowly for a few minutes to enable friction to warm up the metal.



Figure 11-30—Warming up an ax head before chopping.





## Ax Strokes

Cutting a log requires two basic strokes: the forehand swing and the backhand swing. For a right-handed person, the forehand swing refers to a cut on the right side of the log and the backhand swing refers to a cut on the left side of the log. Reverse the instructions for a left-handed person.

### Forehand Swing

While holding the ax firmly at the throat and loosely at the shoulder, raise it over your right shoulder or over your head. Grip the throat of the handle tightly with your left hand. Grip the shoulder of the handle (or wherever your hand is comfortable) loosely with your right hand. As you swing the ax down into the wood, slide your right hand down to meet your left. As the ax releases from the wood, use both hands to raise it to the starting point of your next swing, sliding your right hand back to the shoulder and keeping your left hand fixed at the throat.

### Backhand Swing

The backhand swing is similar to the forehand swing, but you use it to cut the other side of the notch. The difference is in your body position. Turn your body in the direction that you chop. Your hands remain in the same position; the left remains fixed on the throat of the handle and the right stays loose to slide along the length of the handle. The backhand swing feels awkward at first, but feels more natural with practice.

## Chopping Patterns

Chop a log using a circular pattern. The notch has a “V” shape. While there is no set rule, many ax users cut in a clockwise pattern while others cut in a counterclockwise pattern. Some ax users prefer to start on the close side of a log, while others prefer to start on the far side of a log. It is a matter of personal preference and style.

Some people chop horizontal logs from the top while others chop from one or both sides. Top-chopping patterns are different from the side-chopping patterns discussed earlier in this section (see figure 11–20).

When chopping a horizontal log from the top (figure 11–31), the first stroke cuts the far side of the log at a 45-degree angle, with the toe of the cutting edge sticking out of the far side of the log about an inch (some axmen refer to this as “hanging an edge”). The second stroke extends the cut into the center of the log, with the toe of the cutting edge in a portion of the first cut. The third stroke cuts the near side of the log, with the toe in a portion of the second cut and the heel sticking out the near side of the log about an inch.

The fourth stroke begins the other side of the notch. This stroke cuts the near side of the log at a 45-degree angle, with the heel of the cutting edge sticking

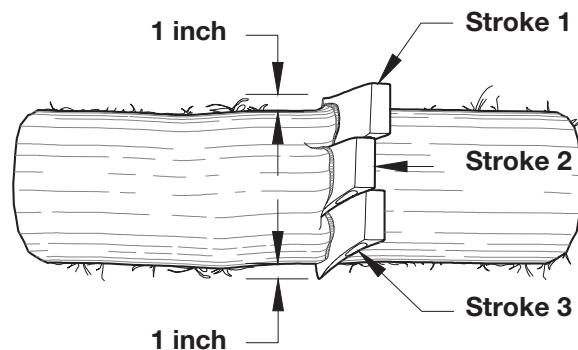
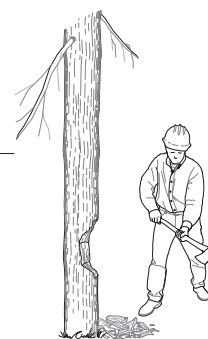


Figure 11–31 —Chopping the top of a log lying horizontally. The first stroke chops the far side of the log; the second stroke chops the center of the log, overlapping the first stroke; and the third stroke chops the near side of the log, overlapping the second stroke.



out of the near side of the log about an inch. The fifth stroke cuts in the center of the log, with the heel of the cutting edge in a portion of the fourth cut. The sixth stroke cuts the rest of the way across the log, with the heel of the cutting edge in a portion of the fifth cut and the toe sticking out of the far side of the log.

Larger logs require the same sequence with more strokes on each side. Smaller logs may only require one or two strokes per side. When you have almost cut across the log, it is common to add a few more strokes to the bottom of the “V” to clean it out and match it with the top of the cut. When you have nearly severed the log, be careful that the cutting edge does not travel through the wood and strike the ground. To prevent the ax from striking the ground, finish the cut with the stunt edge of a double-bit ax or the poll end of a single-bit ax if the wood is thin enough to break without additional chopping (figure 11–32).

Chopping patterns always depend on the log. Every log is different, and every lay of a log is different. You will chop some logs from the top. Other logs you will chop out the near and far sides. Whenever possible, chop in the arc of a circle (see figure 11–19).

### When Chips Fly

When chopping, one side of the cut is the “drive side.” This is the power stroke, and the goal is to reach a little past the centerline of the log. The other side of the cut is the “chip side,” where you lift the wood chips out of the wood. This does not mean that wood chips only pop out of one side of the cut. Wood chips pop out of both sides of the cut, but most chips pop out on the opposite side from the power stroke.

As you remove wood chips from the log, an open face develops. As the open face expands, the energy from your swing becomes more efficient. The ax sinks deeper and removes bigger pieces of wood.

Planning a cut and properly swinging an ax are only part of chopping ergonomically. Body position is important, and it begins with proper foot placement. As you move your feet, move your body. Place your feet firmly and try to keep them as level as possible to maintain proper balance.



Figure 11–32—Using the poll of an ax to break through a log.



### Removing Branches (Limbing)

When removing smaller branches on a downed log (i.e., branches you can sever with one chop), be sure to use a horizontal chop from the back side of the branch and not into the crotch (figure 11–33). Chopping into the crotch can cause the branch to fall back on to the ax or on to you.

Removing larger branches may require a series of cuts. Use a vertical chop followed by a horizontal chop, as shown in figure 11–34. This removes a wood chip and enables you to sever the branch with a subsequent horizontal chop.

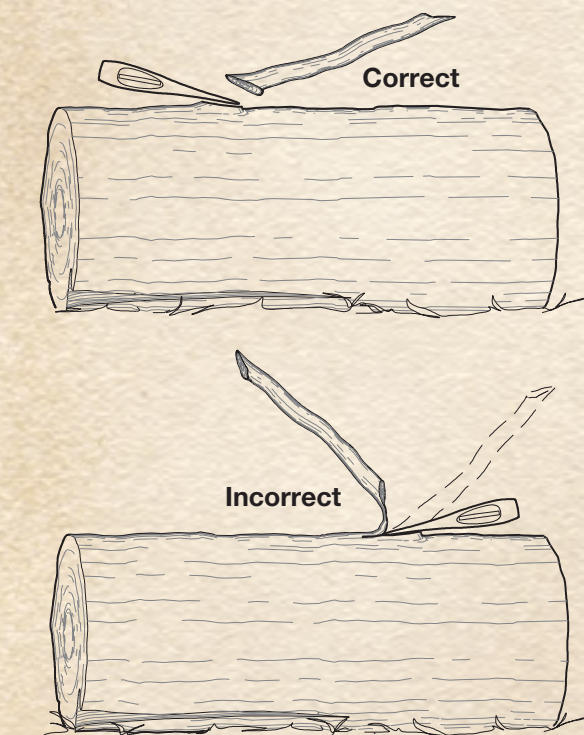


Figure 11–33—The correct and incorrect methods for limbing small branches.

Be careful when chopping branches that are embedded in or are resting on the ground; they may be holding the log in place. Once you sever the branches, the log could move or roll.

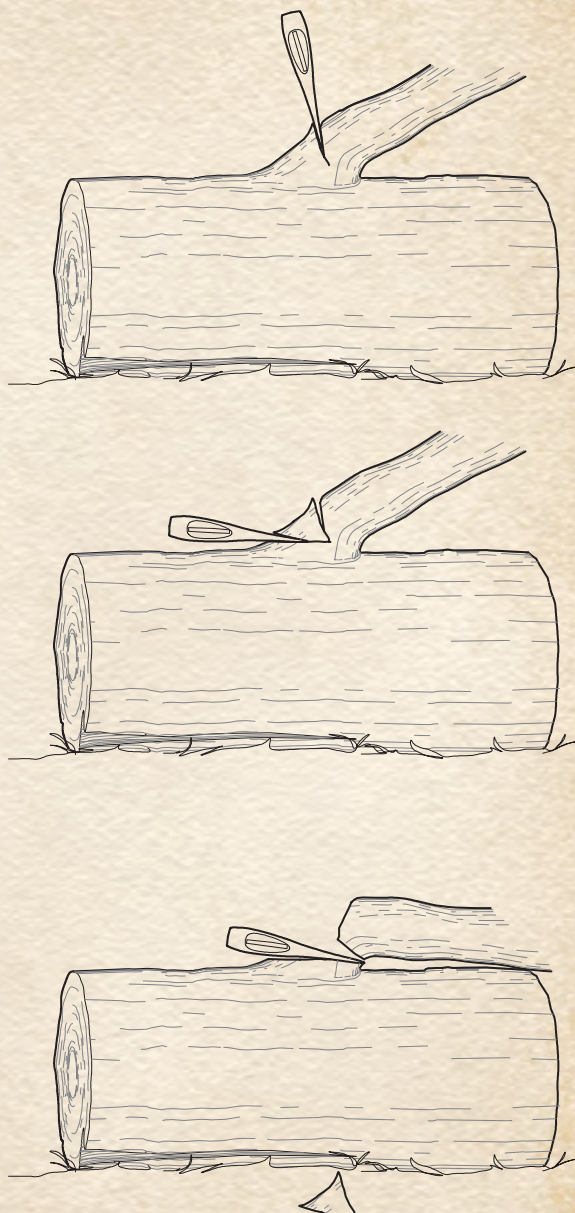
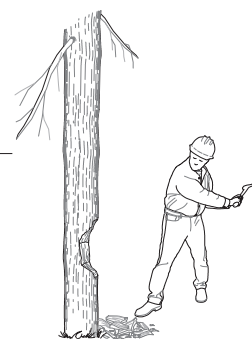


Figure 11–34—Limb large branches by starting with a vertical chop. Follow this with a horizontal chop to remove a wood chip.



### Standing on a Log While Chopping

You may have to stand on top of a log to chop it properly and safely. In this case, cut out footholds on the log so you have a flat place to stand (figure 11–35).

**Standing on a log to chop it is an advanced chopping technique; novice axmen should not attempt it.**

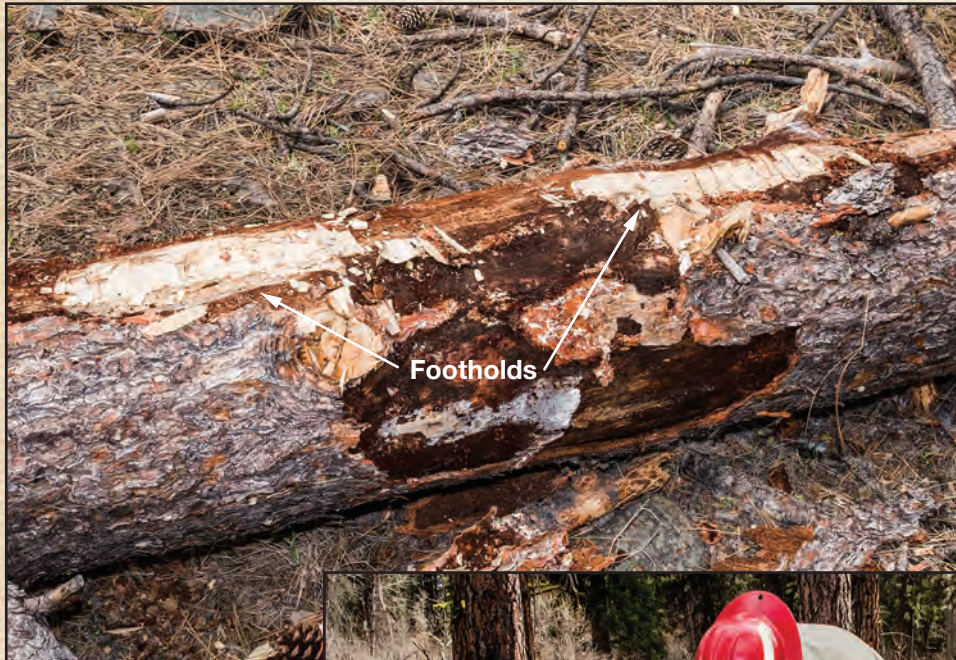


Figure 11–35—Flat footholds cut into a log (left). Standing on top of the log to chop it (below).

