USDA Forest Service
National Sawyer Training:
Developing Thinking Sawyers

Student Guide: Classroom

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Module 2.3: Chain Saw Directional Felling

Introduction

This module teaches the basic concepts of how to directionally fell trees using a chain saw. The instructor will present concepts in the classroom, followed by demonstrations. You will then practice these techniques in the field under controlled and supervised conditions.

Module Topics

- OHLEC for Chain Saw Directional Felling
- Directional Felling Techniques
- The Backcut
- Wedging
- Special Circumstances
- Large Trees

Objectives

When you complete this module, you will be able to:

- Explain directional felling.
- Describe the OHLEC size-up process for directional felling.
- State how you identify the objective of a felling operation.
- Identify common hazards for directional felling.
- Identify the natural lean of a tree.
- Explain the good side/bad side of a tree.
- Identify the calculated lean of a tree.
- Describe the importance of the escape plan.
- Develop a cut plan.
- Describe the proper use of wedges.

Prework Review

- What is directional felling?
- Leans:
  - Good side/bad side
  - Calculating lean

Review Questions

What is the process for directional felling?

What are the five steps in the OHLEC process?

How do you express the leans of a tree?

OHLEC for Chain Saw Directional Felling

Directional felling is the process of establishing a series of cuts to construct a hinge that guides the tree toward a specific objective (where you want the tree to go). Understanding the relationship between the undercut, the hinge, and the backcut is key to your ability to successfully direct a tree into the intended lay.

OHLEC for Felling

During a felling operation, you'll consider the following during your OHLEC size-up:

- **Objective:** Where do you want the tree to go?
- **Hazards:** What are the hazards relative to the objective in this felling operation?
- **Leans:** What are the leans (front, back, or side) in relation to the objective? Where is the good/bad side?
- **Escape plan:** Can you position yourself to escape on the good side? Is the path clear and an adequate distance from the stump or to a place of cover?
- **Cut plan:** Where will you construct the hinge? What sequence of cuts will you use to construct the hinge? What type of backcut will you use? Will you need wedges?

Video: OHLEC for Felling

Watch a video about using the OHLEC process for directional felling. Discuss any questions you may have with your instructor and the class.

Objective

Objective: Where do you want the tree to go? This is the heart of directional felling. Directional felling involves developing a plan for where you want the tree to land (the objective or intended lay). This requires planning and involves multiple steps before you begin any cutting.

Ask yourself:

- Where do you want the tree to end up?
- Is the intended lay free of obstacles?
- Are there swamping considerations?

Measure Tree Height

You can measure the height of tall objects such as trees by projecting a right isosceles triangle (a triangle with angles measuring 45, 45, and 90 degrees, with two sides having the same length) using your arm, a stick, and your line of sight (figures 2.3.1a through 2.3.1d).

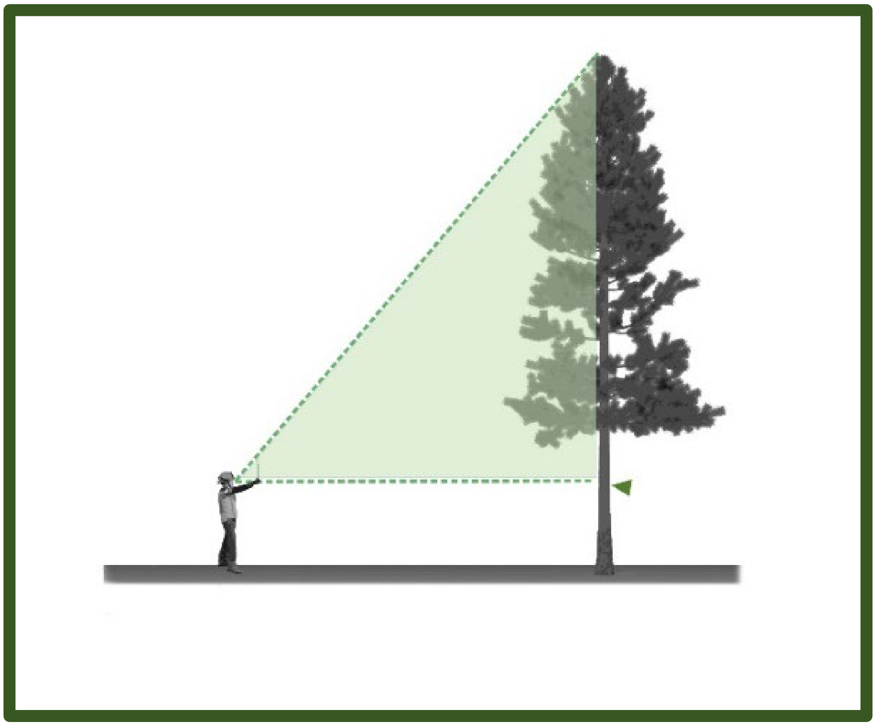


Figure 2.3.1a—Concept for measuring tree height.

While not necessary on every tree, knowing the height of a tree can be beneficial when felling trees around structures or other obstacles, such as fence lines, roads, or streams. Knowing the height of a tree is also beneficial for maintaining work area control.

Figure 2.3.1b—Hold the stick perpendicular to your arm.

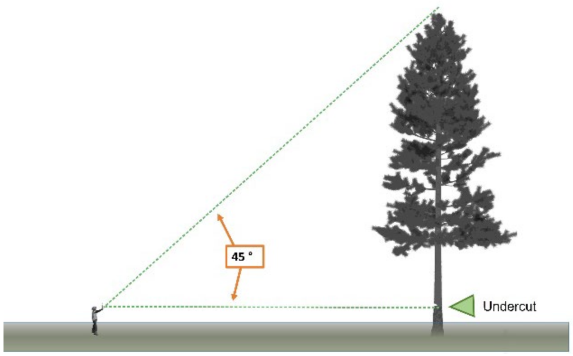


Figure 2.3.1c—Align the stick with the top of the tree and the undercut.

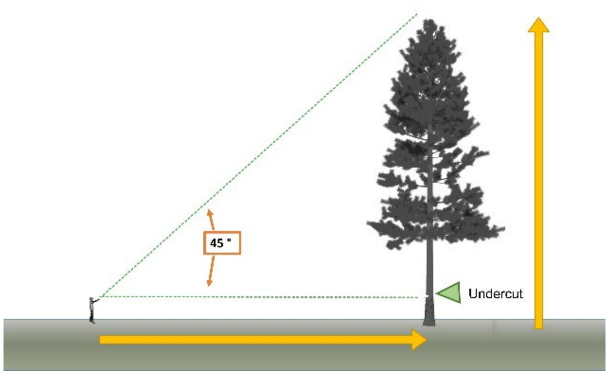


Figure 2.3.1d—The height of the tree is equal to your distance from the tree when you have formed an isosceles triangle.

Procedure for measuring tree height:

1. Hold a straight stick or an ax up to your cheek.
2. Flip it up so you are holding it perpendicular (90 degrees) to the ground. This creates a triangle in which the distance from your eye to your hand is equal to the distance from your hand to the tip of the stick. Be diligent about maintaining a 90-degree angle between your line-of-sight to the undercut and the stick.
3. Move toward or away from the tree until you align the tip of the stick to the top of the tree and the top of your hand to the location where you plan to make the undercut.
   - Note: Wherever you stand, only move your eyes to sight off your hand or the tip of the stick rather than moving your entire head.
4. When you can sight off your hand to the undercut and off the tip of the stick to the top tip of the tree, you are as far away from the tree as the tree is tall. You have formed an isosceles triangle.

   Notes:
   - If you need the height of the tree in feet, you can pace the tree's height or use a loggers tape to measure the distance.
   - This method of determining tree height works best when you stand on a similar elevation as the tree. If felling up or down steep slopes, it is best to gauge the tree's height on a sidehill first and then pace out toward the objective.

Hazards

When sizing up hazards for a felling operation, think in terms of hazards that can directly impact you during the operation. Ask yourself:

- Are there targets that may be in the way of the objective?
- What are the hazards that can directly impact me during the felling operation?
- Can I mitigate the hazards to an acceptable level?
- Are there any overhead hazards?
- What is the condition of the wood fiber?
- Did sounding the tree indicate a solid hinge and wedge platform?

Common Hazards and Their Indicators

Figure 2.3.2—A widowmaker.

Widowmakers:
Widowmakers (figure 2.3.2) are limbs that are no longer attached and hang loose in a tree canopy. They can fall from the canopy and potentially strike you.

Figure 2.3.3—A snag.

Snags:
Snags (figure 2.3.3) are dead or dying trees that pose a risk because wind or vibration can cause them to fall unexpectedly.

Figure 2.3.4—Loose or missing bark.

Loose or missing bark:
Loose bark (figure 2.3.4), particularly on trees with thick bark, can pose a significant hazard if it becomes detached from the bole, falls, and strikes you.

Figure 2.3.5—Multiple stems or cracks.

Multiple stems or cracks at the stem/union: Multiple stems (**schoolmarms**) can pose a risk to you due to the weak union where the stems meet and split apart (figure 2.3.5).

Figure 2.3.6—A red belt conk.

Figure 2.3.7—Pini conks.

Fruiting bodies (conks): Fruiting bodies (figures 2.3.6 and 2.3.7) on the trunk or bole of a tree can be an indicator of rot. Rot can compromise the strength of the hinge and/or the wedging platform.

Figure 2.3.8—A cat face.

Cat faces:
A cat face (figure 2.3.8) is a defect that may limit the hinge location, wedging platform, or felling direction.

Figure 2.3.9—A canker.

Cankers:
Cankers (figure 2.3.9) frequently occur on the stems and branches of pines and hardwoods. Canker fungi cause top-kill, branch death, or stem malformation. Fungi can infect and subsequently decay stem malformations, increasing the likelihood of stem breakage, especially during felling.

Figure 2.3.10—Root rot or burned roots.

Root rot or burned roots:
As the tree's center of gravity starts to move due to cutting, wedging, or because the tree itself is starting to fall, compromised roots can fail (figure 2.3.10), and the tree may fall toward its naturally weighted lean (regardless of the hinge placement).

Figure 2.3.11—A bole crack.

Bole cracks:
Cracks can occur due to lightning, frost, wind shake, internal decay, or because the tree has begun to fail (figure 2.3.11). A crack or cavity in the bole can cause the tree to break off at a weak spot above or below the defect. This is especially hazardous if the tree must push through adjacent canopies as it falls.

Figure 2.3.12—Uplifted roots.

Uplifted roots

Uplifted roots (figure 2.3.12) or a majority of exposed roots are indicators of an unstable tree. The roots could fail and cause the tree to fall prematurely.

Note: If the hazard assessment continues to support the objective, move on to assess leans.

Leans

It is important to determine the type and amount of lean to develop the cut plan. Factors that influence lean include the location and size of limbs and the shape of the canopy.

Types of Leans

The two types of lean are Natural lean and calculated lean.

- **Natural lean** is not relative to an objective; it is the direction that gravity would take a tree if the tree were to fall on its own (figure 2.3.13). It is where the combined mass of the bole, limbs, and foliage is located relative to the center of the base of the tree. Weight distribution higher up in the tree has more influence on the natural lean than weight lower in the tree.
- **Calculated lean** is the amount of front-to-back and/or side-to-side lean (expressed in feet) relative to the objective (figure 2.3.14). It is used to build the cutting and wedging plans that will place the tree into the objective.

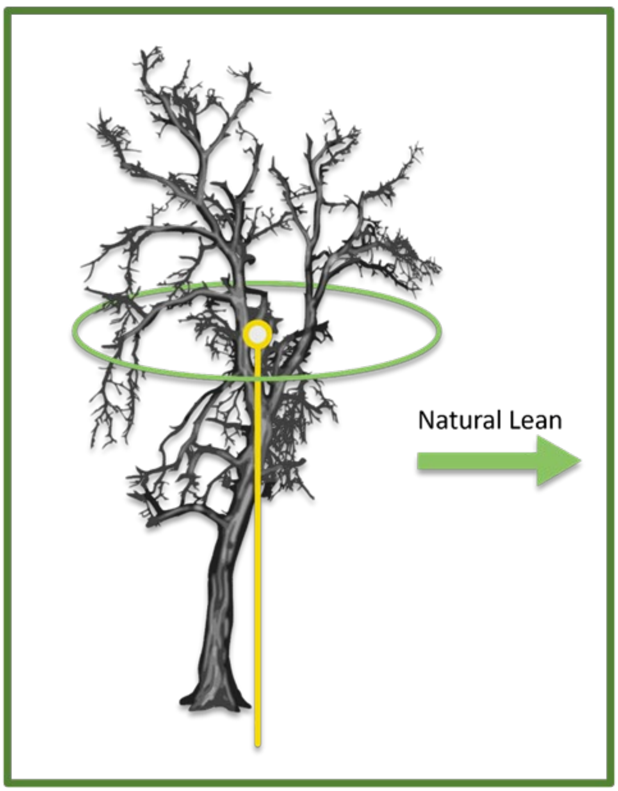


Figure 2.3.13—An example of natural lean.

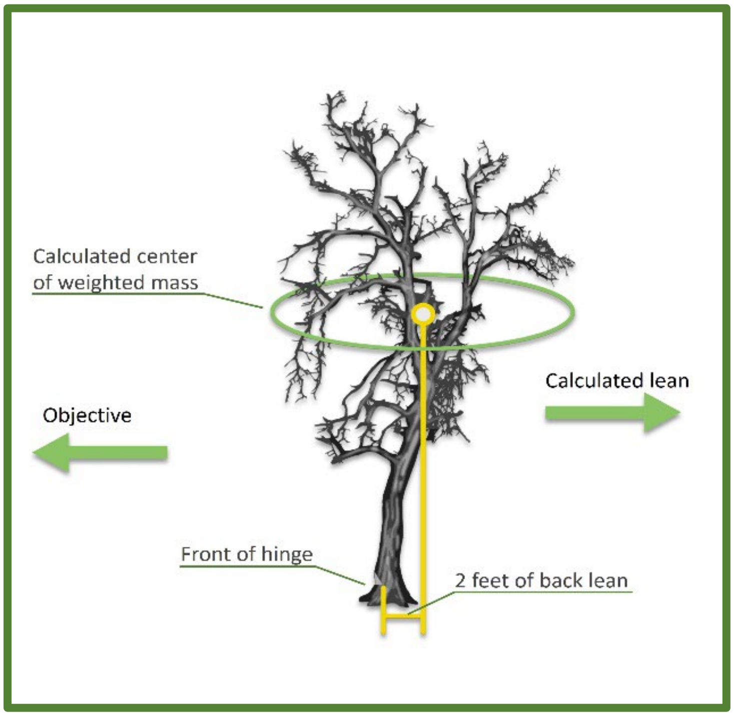


Figure 2.3.14—Calculated lean.

Types of Calculated Leans

Types of calculated lean include front-to-back lean and side-to-side lean (figure 2.3.15):

- Determine **front-to-back lean** by standing on either side of the tree perpendicular to the objective (intended lay) and a tree length away, if possible. If the tree has back lean, you will need a wedging plan to overcome the lean or will need to change the objective.
- Determine **side-to-side lean** by standing in line with the objective either in the intended lay or directly opposite the intended lay. When plumbing the tree, it is most precise to be a tree length away, if possible. Beneath the side lean of the tree is considered the "bad side," as this is where the tree would fall if you fully severed the hinge.

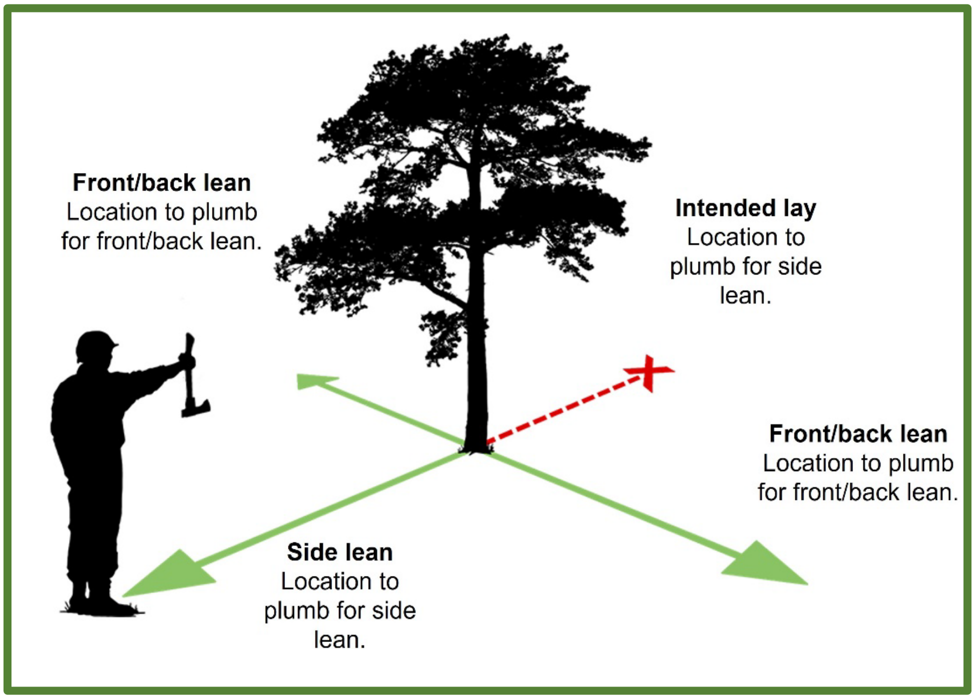


Figure 2.3.15—Types of calculated lean.

Determining the Lean

There are many ways to determine lean. You can use a straight-handled axe, a plumb bob, or your hands. The method you use will depend on your preference and proficiency.

To determine the lean of a tree, stand far enough away from the tree so that you can see the entire canopy.

- **When using a plumb bob**, hold the top of the string in line with the center of the top of the tree and locate the spot where the bottom of the line intersects with the ground or bole of the tree. The distance from the center of the tree is the amount of lean.
- **When using an ax**, hold the ax by the handle with the head down. Grasp the ax as far from the head as practical and hold it so the ax can swing side to side. Sight down one side of the handle until it is in line with the center of the top of the tree, and locate the spot on the bottom where the handle intersects with the ground or bole of the tree. The distance from the center of the tree is the amount of lean.

- **When using your hands**, make a window by holding the index fingers and thumbs of both your hands together. Adjust your hands until you can visualize the bulk of the canopy through the window framed by your hands. Make sure the window encompasses the tips of every branch. Next, find the location where the mass of the bole, limbs, and foliage combine, then visualize splitting the mass in half by projecting a straight line to the ground. The distance from the center of the tree to the spot on the ground indicates the amount of lean.
- **When using your hand and plumb bob together,** hold the plumb bob to eliminate visual error from the hand method (figure 2.3.16).

Regardless of the method you use, with some practice and experience, being able to determine a tree's lean will soon become second nature.

Note: If the lean assessment supports your objective, move on to the escape plan.

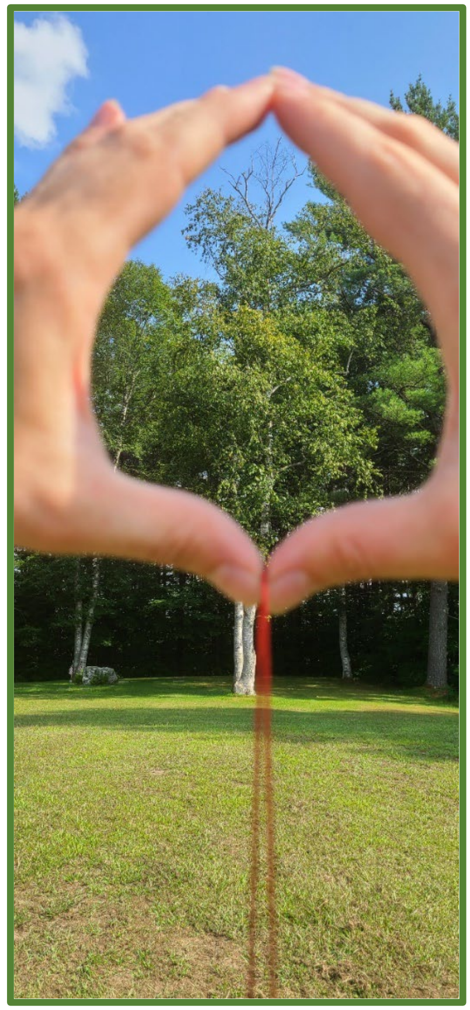


Figure 2.3.16—Using a hand and plumb bob combination.

Good Side/Bad Side

The concept of the good side and the bad side of a tree is function of tree lean and directly relates to your safety.

The bad side of a tree refers to the side under the naturally weighted lean of the tree where a tree could fall if the hinge breaks or is unintentionally severed. Whenever possible, you should work from the good side of the tree.

Escape Plan

Before starting a felling operation, you must develop an escape plan (figure 2.3.17). The plan should include determining and clearing an escape path and should also include an alternate path in the event that something unexpected happens.

Whenever possible, you should finish cutting/wedging and escaping on the good side of the tree. Once the tree begins to fall, you should immediately move a safe distance away while keeping your attention on the falling tree and your surroundings.

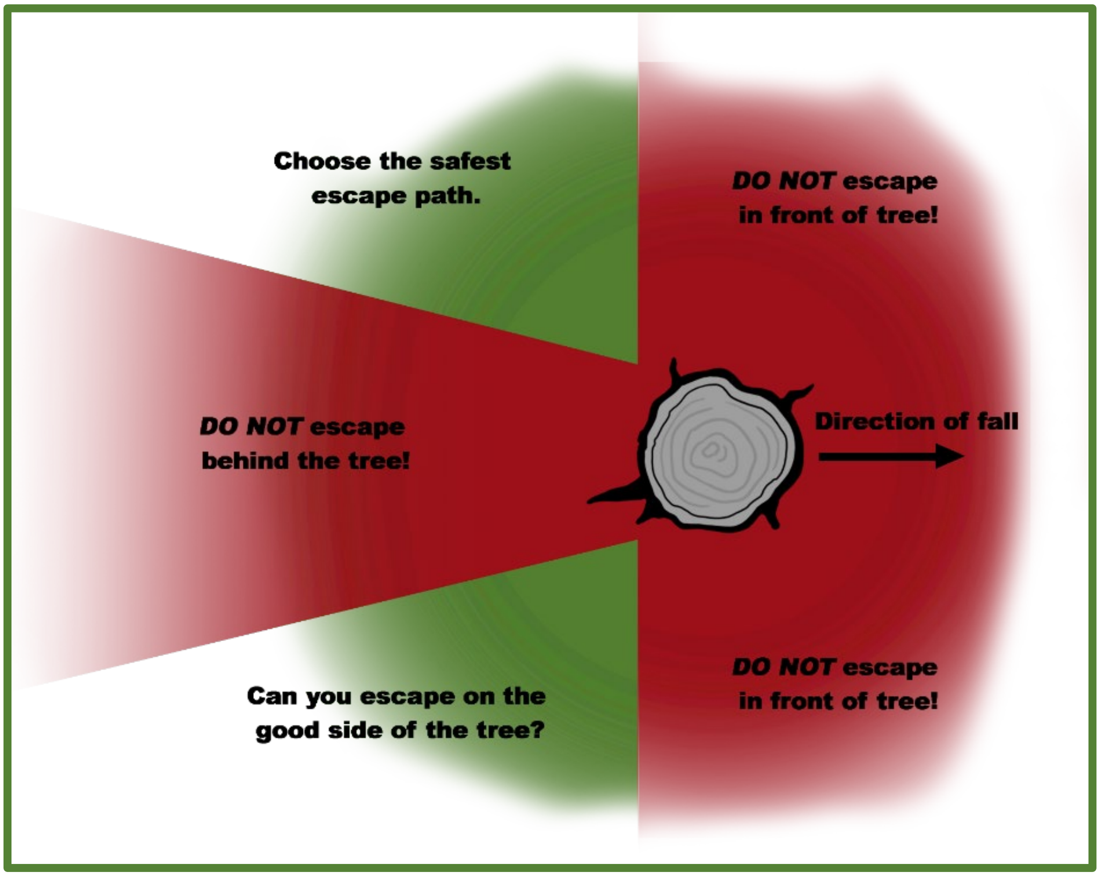


Figure 2.3.17—An escape plan.

If the escape plan supports the objective and provides for your safety, continue to the cut plan.

Cut Plan

The cut plan is the last stage of the cutting operation size-up and it determines the type and sequence of cuts that will ultimately guide the tree or log segment into the objective.

The cut plan accounts for the objective, hazards, leans/binds, and escape plan. The cut plan is the final step in OHLEC and is how you tie the plan elements of the size-up process together. The cut plan determines the types and sequence of cuts you will use.

If the cut plan requires you to use wedges, you must develop a wedging plan before initiating the cut.

The wedging plan includes the number, kind, and size of wedges needed and the sequence for setting the wedges.

It generally takes three cuts to fell a tree. Two of the cuts form the undercut, and the third cut is the backcut. The relationship between these three cuts forms the hinge, which will guide the tree into the objective. For this reason, properly constructing a hinge is critically important to any felling operation.

Hinge

There are several ways to form a hinge and fell a tree, but all follow the same basic principles and anatomy of a hinge. Figure 2.3.18 shows the undercut, the hinge, and the placement of the backcut.

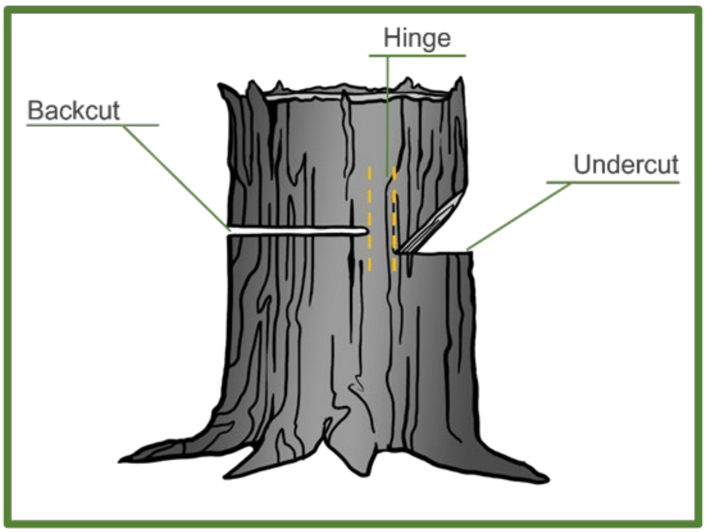


Figure 2.3.18—Anatomy of a hinge.

The length and width of the hinge aids in holding the bole to the stump as the tree falls. The fiber must be strong enough to hold the bole to the stump, yet flexible enough to bend, allowing the tree to move into the undercut as it falls into the objective.

A hinge that is too wide will not bend, and the tree will be difficult to move and may require a lot of wedging. A hinge that is too thin may break and cause a loss of control.

Hinge Design

When constructing a hinge, it is helpful to use the 80+ percent/10- percent guideline (figure 2.3.19). The 80 percent refers to the hinge length (distance across the stump) and the 10 percent refers to hinge width (front to back).

80+ percent/10- percent provides the guiding metrics used to initially determine the desired hinge length and width needed during a felling operation.

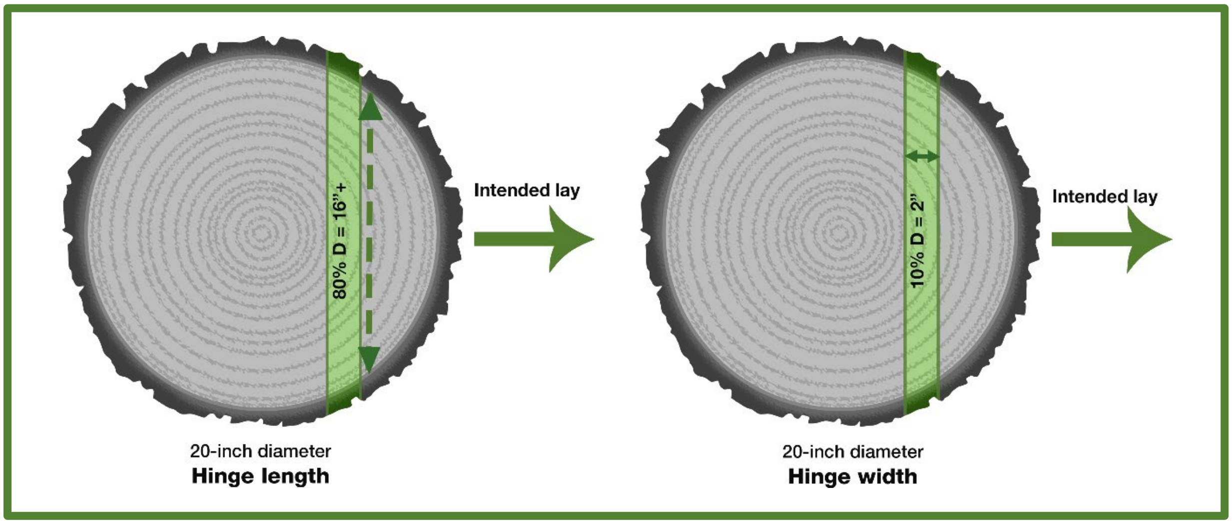


Figure 2.3.19—Hinge design.

You express these metrics as a percentage of the tree diameter at breast height (DBH, at 4 ½ ft above the ground). Targeting a minimum hinge length of 80 percent of DBH reduces the chance of over cutting the diameter of the bole and allows for a greater margin of error when trying to match cuts.

You should bring the backcut, which sets the back of the hinge, forward to a point where the remaining unsevered fiber is a maximum width of 10 percent of DBH. Both these metrics depend on tree conditions; you may need to change them depending on tree species, wood fiber condition, and lean. On trees with side lean, you may need a longer hinge length (more than 80 percent) to support the weight of the tree.

Hinge placement in relation to the tree diameter and center of gravity can also play a role when wedging. A hinge located more to the front of the bole will provide a longer wedging platform with more mechanical advantage. A hinge located closer to the middle of the bole will establish a shorter wedging platform and require more effort to lift the tree.

- **Bole shape:** The bole of a tree is seldom perfectly round. Considering the shape of the bole when placing the hinge can increase cutting efficiency by reducing the amount of cutting needed to obtain the minimum 80-percent hinge length. It can also be useful for increasing hinge holding power by locating for maximum hinge length.
- **Stobs:** Trees with the tops missing and broken off are called “stobs.” The challenge with stobs is that they have little to no mass or weight, so thinning the hinge in conjunction with a deeper undercut helps to fell the tree. Stobs are almost always

taken with the natural lean. To fell stobs, a deeper undercut (near 100 percent hinge length) is preferable to using excessive wedging. The deeper undercut also moves the center of gravity forward (toward) the objective.

Video: Hinges

Watch a short video to get a better understanding of how the hinge works, then discuss any questions with your instructor and the class.

Fiber Characteristics

Fiber tensile strength and flexibility vary greatly, depending on the tree species. Knowing the characteristics of the tree fiber you are working with is critical to constructing the hinge. Another relevant consideration is the different bole decay profiles of different species.

Sounding

Sounding the tree after removing the bark can help provide you with specific hinge fiber quality information at the anticipated hinge corners.

Note: Tree species will sound different because of their differing fiber density:

- A loud crack indicates sound or good fiber
- A softer crack or dulled thump indicates weakened, punky, or rotten fiber
- An echo indicates a void or hollow

Though sounding is a valuable tool, developing the skill to apply sounding knowledge effectively takes practice and experience.

Boring

Boring is the best way to verify hinge and wedging platform conditions. You should consider boring when felling standing dead trees or trees where you suspect rot. Monitor the cut chips while boring. Rotten fiber will often appear as darker brown dust that is distinctively different from the longer wood chips of sound wood. You should bore vertically and perpendicular to the hinge wood to reduce the impacts to the hinge and wedging platform. Be careful not to compromise the hinge wood.

Remember: Observe overhead hazards and look up often!

Though sounding and boring are valuable tools for the sawyer, developing the skill to apply this knowledge effectively takes practice and experience. Become familiar with decay profile characteristics and the species you work with.

- **Lean:** Side lean is generally more difficult to control than front or back lean. Always plan to increase hinge length with a side leaning tree. With a front or back lean, it is generally best to design the hinge closer to 80 percent to either maximize room for wedging (neutral or back lean), or the slab size for a triangle back cut (forward lean).
- **Live or dead tree**: Dead fiber is generally less flexible than the fiber in a live or green tree. Expect less hinge control with dead trees.

Undercuts

An undercut removes the wedge section on the front part of the tree that you are felling. The undercut forms an opening (notch) in the bole to set the front portion of the hinge (figure 2.3.20).

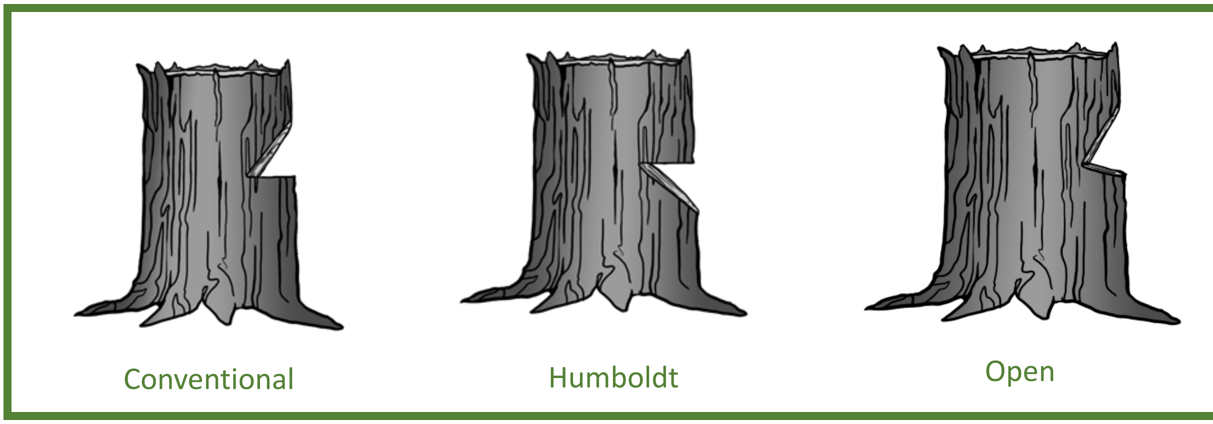


Figure 2.3.20—Different types of undercut.

An undercut made with a 45-degree opening and the sloping cut on the top is called a "**conventional undercut**." This method originally came from using axes to chop out the undercut.

The "**open-face undercut"** is defined as an undercut that has an opening angle of 70 degrees or more. A wider undercut enables the tree to stay attached to the stump for longer.

The "**Humboldt undercut"** has a 45-degree opening and the sloping cut on the bottom. Sawyers often use this undercut when working on steep ground. This method can also make removing large undercuts easier when felling large-diameter trees.

Dutchman

Regardless of the angles of the two cuts that form the undercut, you should match both cuts exactly to avoid forming a bypass (Dutchman), as shown in figure 2.3.21, which could cause the hinge to break prematurely and result in the loss of control when felling.

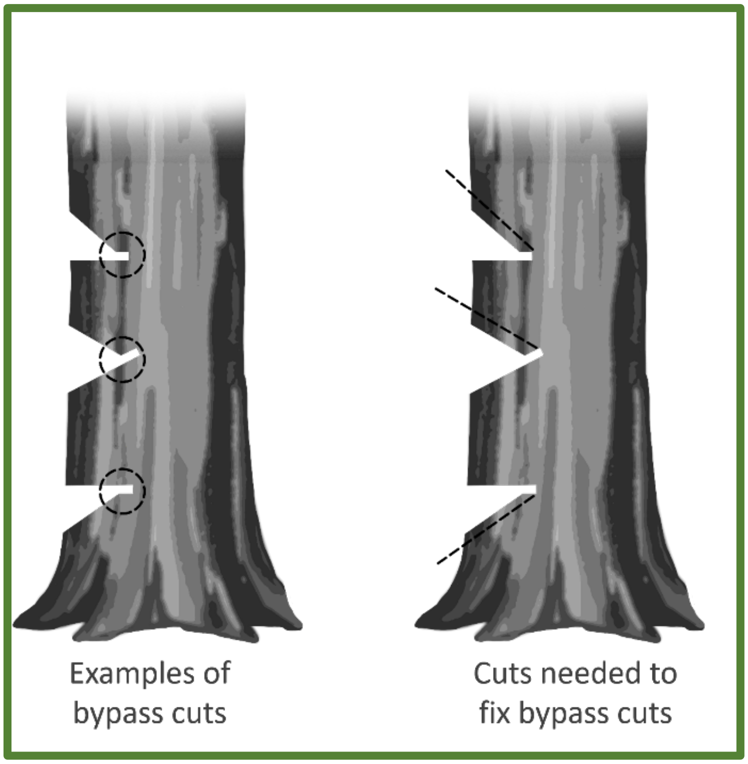


Figure 2.3.21—Examples of bypass cuts and the cuts required to fix them.

Step or Stump Shot

Step or stump shot: The Occupational Safety and Health Administration (OSHA) requires the use of a step (stump shot) when the undercut is less than 70 degrees. You create a stump shot by making the backcut slightly above the apex of the notch (figure 2.3.22). The intent is to prevent the bole of the tree from sliding back over the stump. The height of the step depends on the size and condition of the tree.

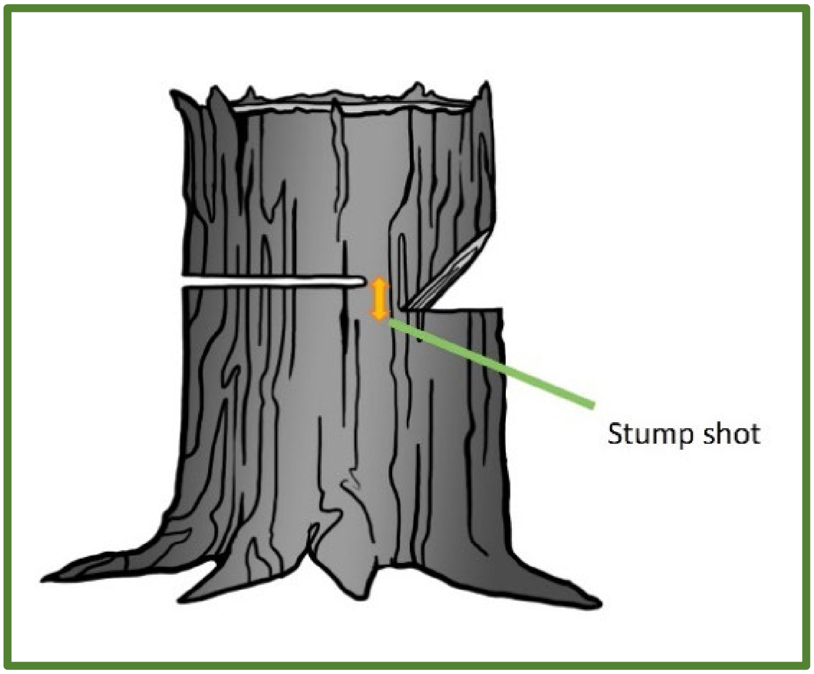


Figure 2.3.22—An example of a step (stump shot).

Directional Felling Techniques

We will now discuss some common techniques you will need to know for felling operations.

Aiming for the Objective

Directional felling requires an understanding of right angles, powerhead design, and selecting the proper aiming location. You can achieve greater accuracy in hitting your objective by using the gunning sights of the saw to aim and line up your cuts. Gunning sights are a single line, either painted or embossed on the body of the saw, set perpendicular to the bar. To use the gunning sights properly during a horizontal cut, you must position yourself directly behind the powerhead of the saw and sight down the gunning lines towards a predetermined aiming spot.

Knowing were to aim the gunning sights to hit your intended lay requires you to select a particular spot that is slightly offset from the center of the tree bole (figure 2.3.23).

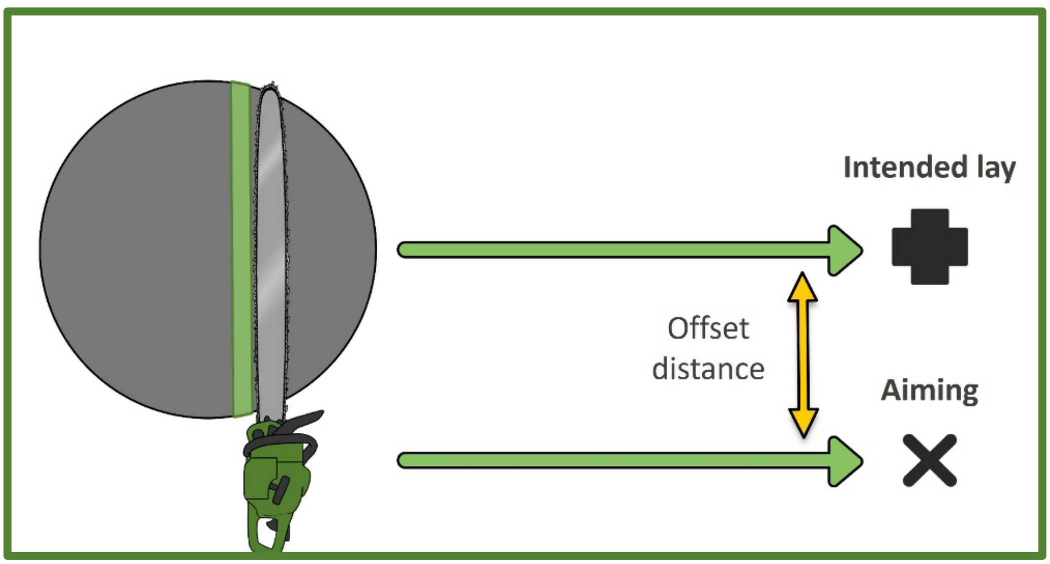


Figure 2.3.23—Aiming for the objective.

Example: Assuming that a tree is straight and the top of the tree aligns with the center of the bole, observe the distance from the center of the bole to the gunning sights on the powerhead of the saw. The size of the tree bole will directly impact the distance between these two points. You will use this offset distance when selecting a point at which to aim. The point must be parallel and adjacent to the intended lay. When possible, you can increase accuracy by choosing an aiming spot that is a good distance off, beyond where you expect the top of the felled tree to impact.

Compensating for Side Lean

To compensate for side lean, first determine where you want the top of the tree to land, then plumb the tree to determine the amount (in feet) of side lean present (figure 2.3.24). You will use this distance to offset your aim.

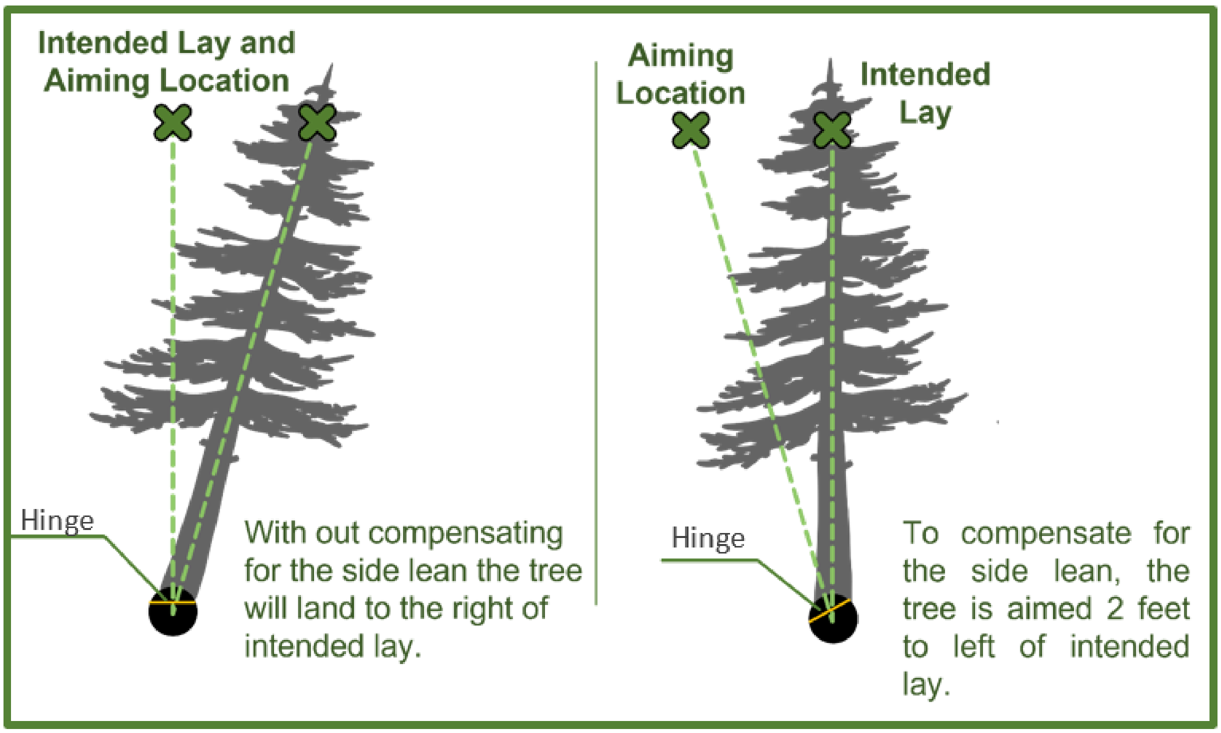


Figure 2.3.24—Compensating for side lean.

Example: If the tree leans 2 feet to the **right** of the intended objective, you must face the undercut to aim the tree 2 feet to the **left** of the objective.

The Backcut

The backcut is the final cut to isolate the hinge and fell the tree. There are different methods to execute a backcut. You will base the method you use on individual tree characteristics and the various conditions you may encounter.

Conventional Backcut

Start the backcut at the back of the tree and proceed forward toward the undercut. Make sure the cut is parallel to the front of the hinge (figure 2.3.25).

Pay special attention to the offside of the tree so that you do not inadvertently cut off the hinge or leave it too wide. Learn to use the saw's gunning sights to help with alignment while periodically stopping the backcut to double check your accuracy.

As you progress the backcut, observe the tree and kerf for movement. Once the tree is committed to the lay, make a quick but methodical retreat using your predetermined escape path.

If necessary, insert a wedge. Once you cut the hinge to the desired width, remove the saw, and drive in the wedge until the tree begins to commit to the intended lay.

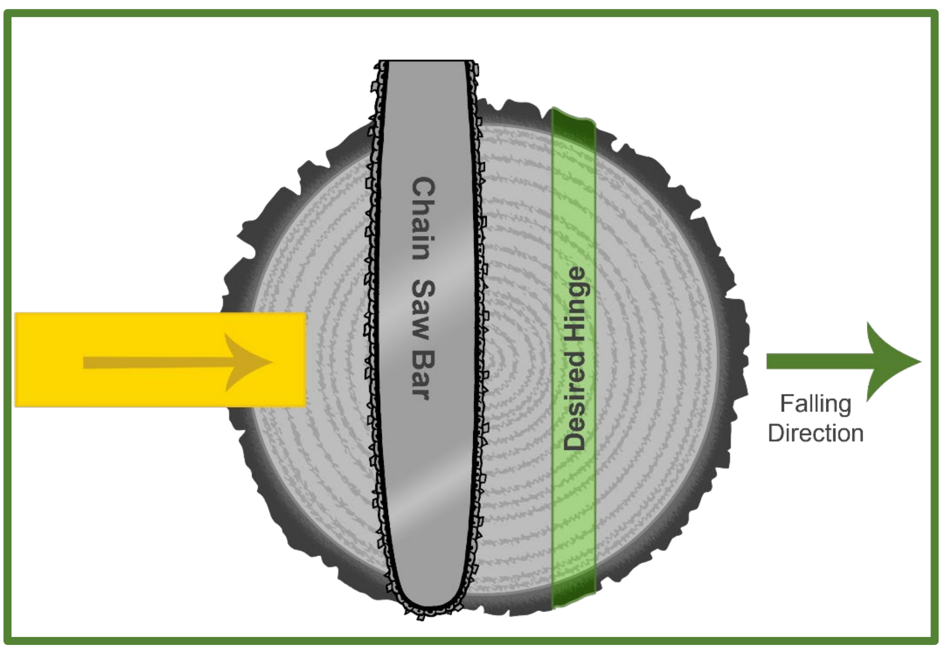


Figure 2.3.25—Conventional backcut.

Boring the Backcut

Initiate the bore cut on the near side of the tree, behind the desired hinge. The bore cut should be level across the bole. Once you have made the cut all the way through the tree, progress the cut toward the back of the hinge until you reach the desired hinge width (figure 2.3.26).

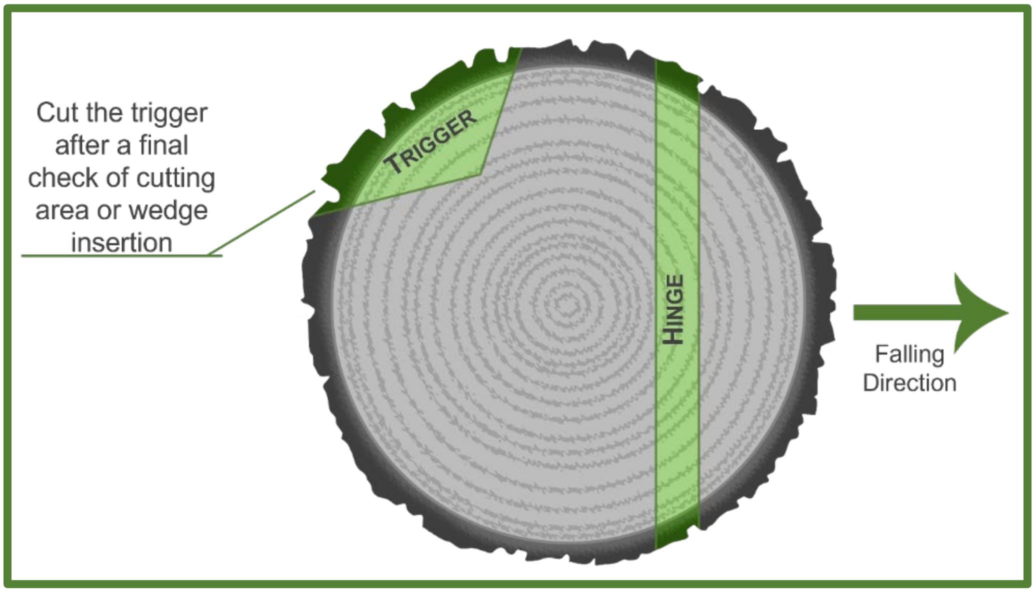


Figure 2.3.26—Boring the backcut.

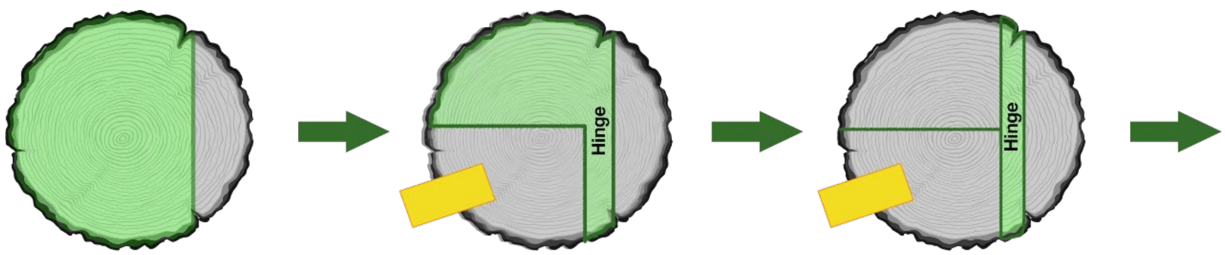
You may finish the boring backcut in one of two ways. Either continue the backcut directly out the back of the tree or stop short of the back, leaving a strap of wood wide enough to support the size of the tree you are felling.

This strap, or **trigger**, will support the tree, giving sufficient time for you to perform a final check of the cutting area or to insert wedges into the backcut. When you’re ready, cut the trigger. Once the cut is complete and the tree begins to move, use your escape path.

The Quarter-Cut Backcut

You can use the quarter-cut backcut when a tree has side lean or back lean, or when the chain saw bar is not long enough to reach across the tree. The quarter cut facilitates the use of wedges on small-diameter back-leaning trees (figure 2.3.27).

The key is to remove only a portion of the backcut at a time, allowing you to insert a wedge into a relatively stable tree.



1. Remove undercut.

2. Cut half of the backcut on the bad side of the tree. Insert wedge if needed.

3. Finish the backcut and escape on the good side of the tree.

Figure 2.3.27—A quarter-cut backcut.

Wedging

Sawyers use wedges to drive a kerf apart and guide the bole of the tree into the objective. A sawyer typically carries three or more wedges, depending on the task at hand (figure 2.3.28).

Wedge Uses

As you drive a wedge into the kerf, the force developed effectively lifts the back of the tree and moves (rotates on the hinge) the top of the tree forward. This redistributes the center weight of the tree forward into the objective. To facilitate this movement, you should time the cadence of your strikes with the forward rocking of the tree. Take special care to watch for limbs, bark, or tops which you may have knocked loose.

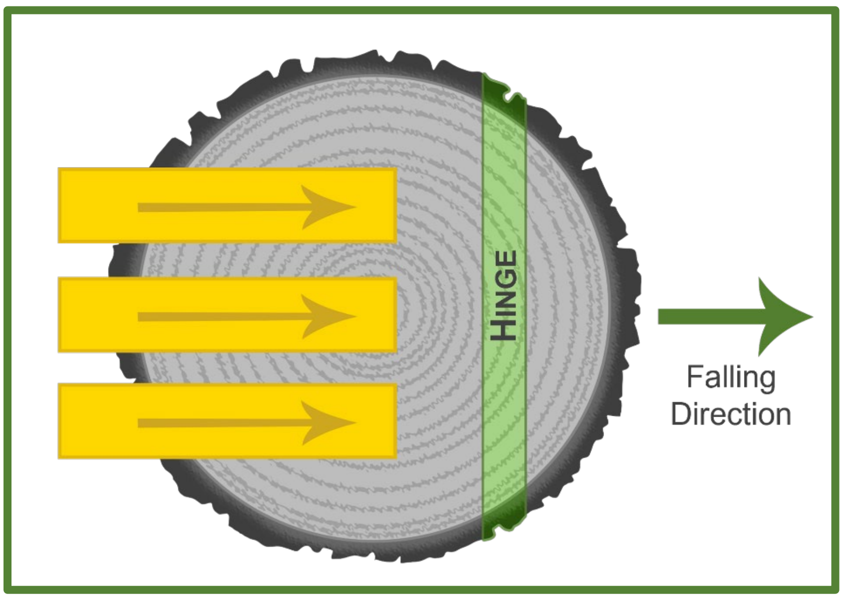


Figure 2.3.28—Using multiple wedges.

In situations where you need more than one wedge to overcome back lean, stacking wedges becomes necessary). When you stack two 1-inch wedges, you double the amount of lift. It is a common practice to put sawdust in between the wedges to lessen the likelihood of a wedge **shooting** out when struck. We cover stacking wedges in more detail in Module 6.

Stabilizing Wedges

On trees with side lean, when using a quarter or boring backcut, you can place a stabilizing wedge parallel to and behind the hinge (figure 2.3.29). This can prevent the hinge from failing due to the side weight of the tree.

Only snug this wedge; do not pound on it or it may break the hinge. The theory is to support the hinge and not **lift** the side of the tree. Depending on the amount of side lean and the support needed, you can insert additional wedges.

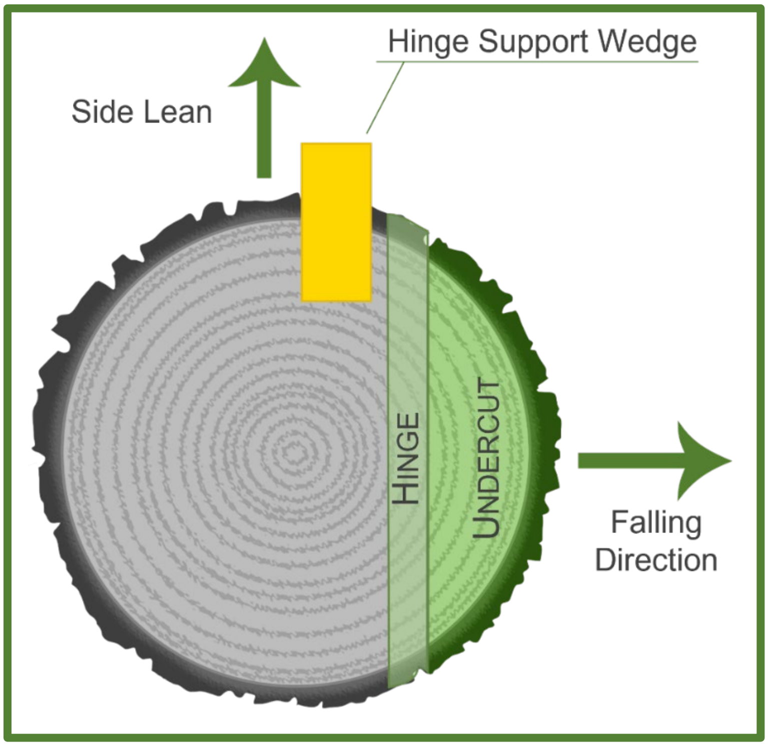


Figure 2.3.29—Using a stabilizing wedge.

Indicator Wedge

You can place a wedge in the kerf of the backcut to help you visualize tree movement (known as an “indicator wedge”):

- As soon as possible, place just the tip of the wedge into the kerf.
- Continue with the backcut. A wedge that begins to drop indicates that the kerf is starting to open and the tree is beginning to fall.

Trees with Back Lean

You can use wedges and cutting techniques to redirect trees that lean opposite the intended felling direction (figure 2.3.30).

Wedges lift the back of the tree and redistribute the weight or center of gravity of the tree toward the undercut.

In general, once you initiate a backcut and there is sufficient room, you will insert a wedge. After you have carried out the backcut to the desired point, you can remove the saw and strike the wedge until the tree begins to fall.

When felling trees with back lean, it is very important to realize that you will be operating from the bad side of the tree for most of the felling process. Remember to factor in this consideration when you reassess your plan with the OHLEC size-up process.

Figure 2.3.30— A tree with back lean.

Special Circumstances

Special circumstances add complexities to felling operations. The following sections provide information about some methods for felling trees with additional complexities.

Barberchairs

A barberchair is an explosive release of wood fibers that are under tension (figure 2.3.31). It results in a vertical split of the tree bole.

- The dynamic splitting motion launches the straightening fiber slab upward and/or outward from the bending fiber in an uncontrolled release of energy. This can sometimes completely sever the stem and even throw the freed slab many feet away from the original stump location.
- It is very difficult to develop an escape plan for a barberchair.
- Heavy, forward leaning trees, the presence of a Dutchman, or a poorly constructed undercut can cause a tree to barberchair.

Figure 2.3.31—A barberchair.

Considerations/Mitigations

Reducing the amount of wood fiber under tension will reduce the likelihood of a barberchair.

Two methods for reducing wood fiber under tension are:

- The boring backcut
- The triangle method
- **Note:** The triangle method is covered more fully later in this module.

Tree Sits Back

Sometimes when you are completing a backcut, the tree sits back and pinches the bar.

This can happen because:

- You misjudged the tree's lean.
- A wind gust pushes the tree backward.
- The tree bole has hidden rot.
- You failed to insert a wedge early enough.

If the tree is large enough and sufficient hinge wood remains, you can sometimes wedge the tree over into its objective. Insert wedges into position A (if possible) in figure 2.3.32 and drive them until the tree lifts.

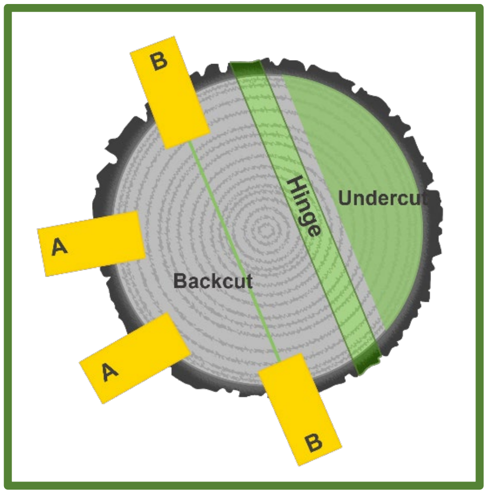


Figure 2.3.32—Using wedges to move a tree into its objective.

If there is no room for wedges in position A, place wedges in position B and alternate striking them until the tree lifts.

Sometimes, in situations where you have misread the lean and have not inserted wedges, the tree sits back heavily enough that you cannot insert wedges into position A.

In these situations, you can refell the set-back tree, even into the opposite direction (figure 2.3.33). Your first option in these situations should be to seek advice from a more experienced sawyer. If you decide to refell a set-back tree, you must be extra cautious while working on and around it.

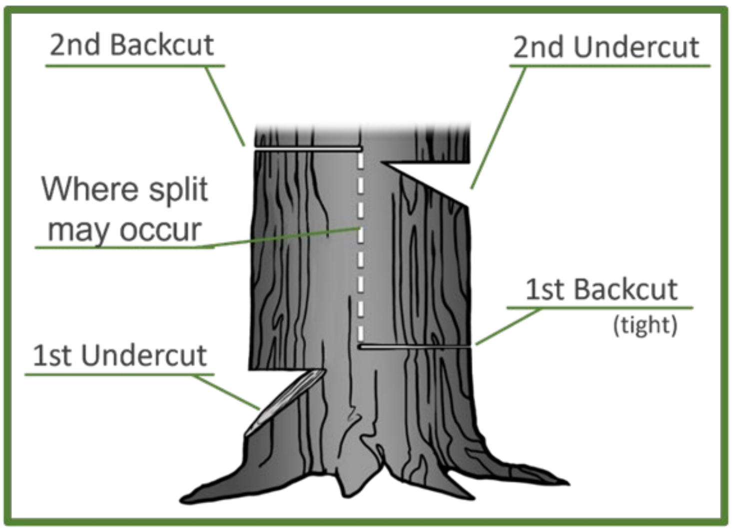


Figure 2.3.33—Alternative method for a pinched bar.

Important: Since the felling plan has changed from the original objective, you must re-evaluate the situation using the OHLEC size-up process. If you are going to back-fell the tree, remove the power head from the saw so that, if something goes wrong, you won't smash your saw.

Limb Tied Trees

Trees grown close together and with limbs intertwined (figure 2.3.34) often need to be felled together. If you cannot see all the limbs, assume that they are interlocked and fell the trees together:

- Using standard undercut and backcut techniques, execute the cuts and place a wedge in the backcut.
- Once you prep the first tree, be extremely cautious while working on the second tree.
- Without turning your back, use a standard undercut and backcut technique to create a hinge that aims the second tree in the same direction as the first tree (hinges are parallel).
- When ready, release the second tree, allowing both trees to fall together.

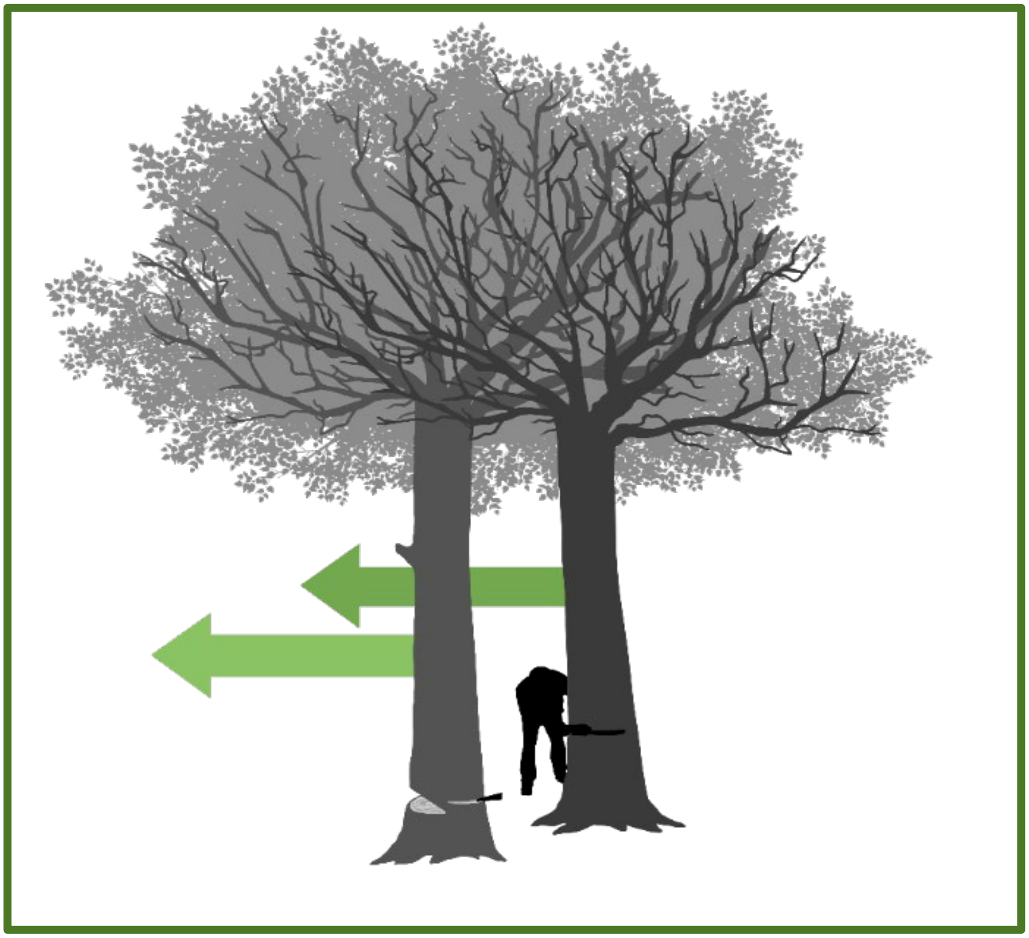


Figure 2.3.34—Limb tied trees.

Heavy Forward Lean: Triangle Method

The triangle and boring backcut methods reduce the amount of wood fiber that is under tension and therefore lessen the potential for a tree to barberchair. We already discussed the boring backcut method when discussing how to compensate for side lean. Let's look at the steps for the triangle method (figure 2.3.35):

- Construct an undercut without pinching the bar.
- Make a partial backcut on both sides of the tree, forming a triangle-shaped piece of uncut wood. If the tree has side lean, cut the compression side first.
- Finish the backcut toward the hinge, watching for tree movement.
- When the tree begins to fall, follow an escape path to safety.

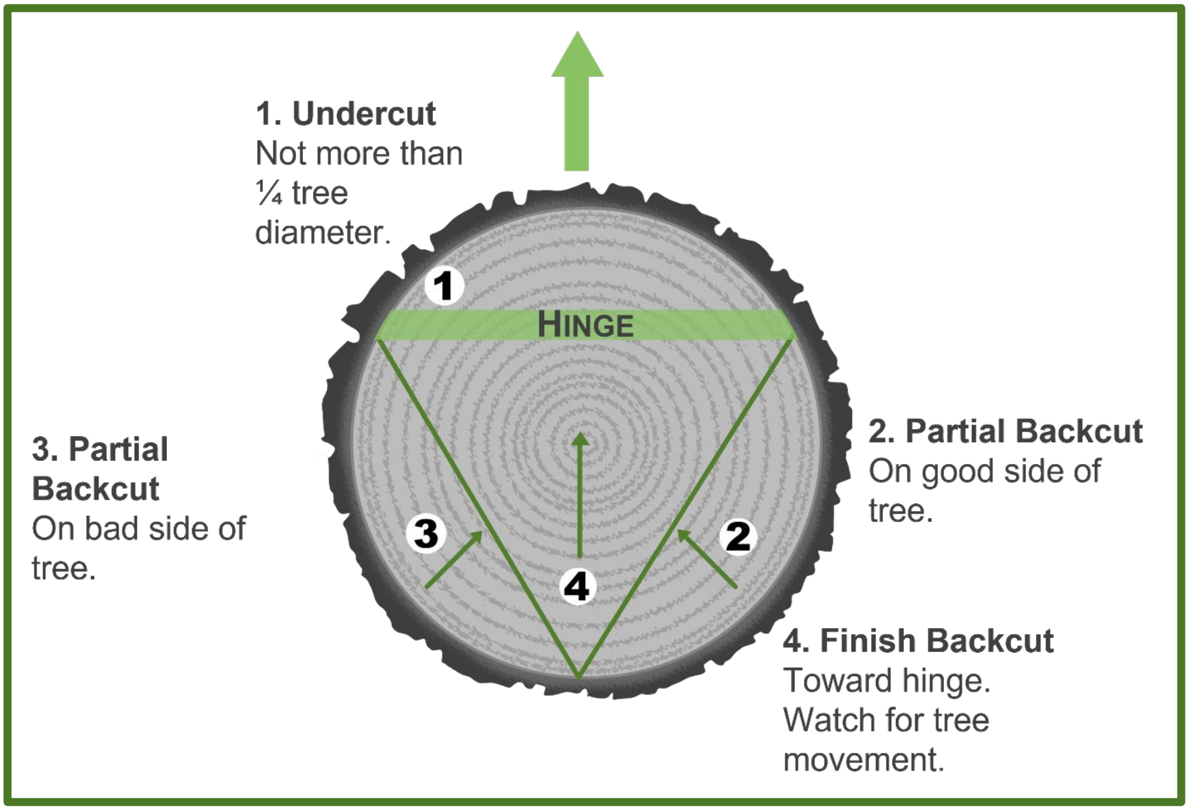


Figure 2.3.35—The triangle method.

Large Trees

You may often need to fell trees with a wider diameter than the chain saw bar. You can use the methods in the following sections when you encounter these trees.

Double Cutting

Double cutting is a technique sawyers use to cut trees that have a diameter wider than the length of the chain saw bar. This method requires you to make two horizontal cuts and two sloping cuts from opposite sides of the tree (figure 2.3.36).

Depending on the size of the undercut you remove, it may be necessary for you to vertically bore into the undercut. This connects the sloping and horizontal cuts and enables you to remove the first half of the undercut before going to the other side of the tree and removing the second half of the undercut.

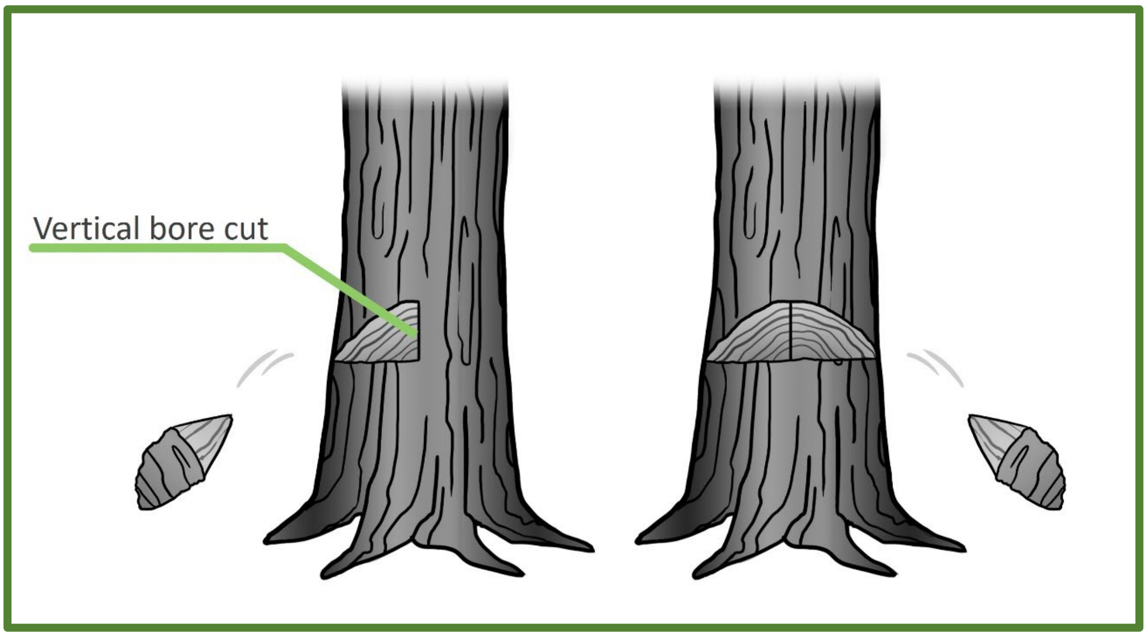


Figure 2.3.36—Double cutting.

Trees More Than Twice as Wide as the Bar Length

To make felling cuts on a tree with a diameter that is more than twice the length of the chain saw bar (figure 2.3.37):

- Cut a large and open undercut to create room for the powerhead in the undercut notch.
- Bore in and cut a recess into the center of the undercut.
- Using a boring backcut, first set the hinge width on one side of the tree.
- Saw around the rest of the tree, inserting a wedge in the back.
- Finish the backcut, leaving the proper hinge width.

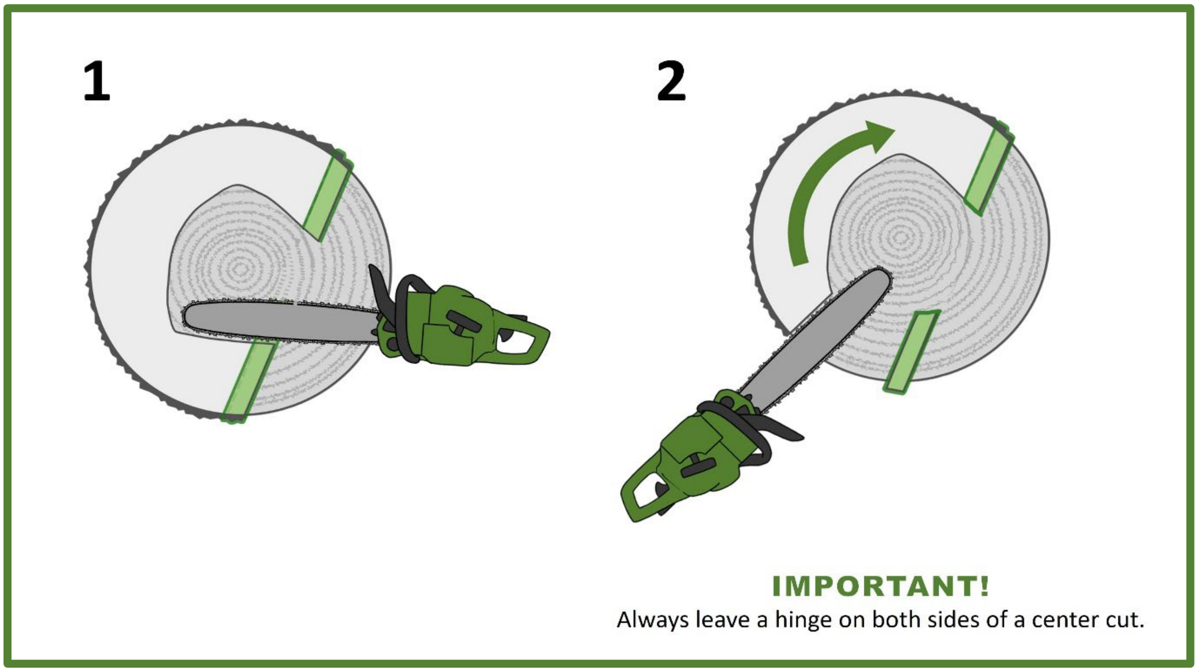


Figure 2.3.37—Felling cuts for a tree diameter more than twice the length of the chain saw bar.

Operational Complexity: Putting it All Together

Complexity is defined as:

> "A characterization of the cutting operation and the elements the sawyer will have to manage while implementing it. The complexity will also determine the level of knowledge, skill, experience, and certification a sawyer will need."

Complexity is not managing the risks of the operation, but rather how you manage all aspects of the sawing operation. While determining complexity is subjective, it is one of the most important processes for you to understand and implement.

Example: Managing the complexity of a cutting operation is like driving a car. Many different elements influence the complexity of a driving situation:

- Is it sunny, raining or snowing?
- Is it nighttime or daytime?
- Is the vehicle in good working condition?
- Is it rush hour or light traffic?

The driver's decision of where and when to drive can be highly variable, but the driver must make an honest assessment of the situation and decide whether to proceed.

As a sawyer, you must do the same thing. Once you complete the OHLEC size-up process and incorporate the different elements into your cut plan, you must determine whether you have the knowledge, skill, experience, and qualifications to manage the complexity of the cutting operation (figure 2.3.38). If the complexity does not align with your abilities, go back and reassess your objective. Even if you think you have the knowledge and experience to implement the cut plan, now is also the time to do a gut check to make sure your head is in the game. Consider seeking mentorship from a more experienced sawyer.

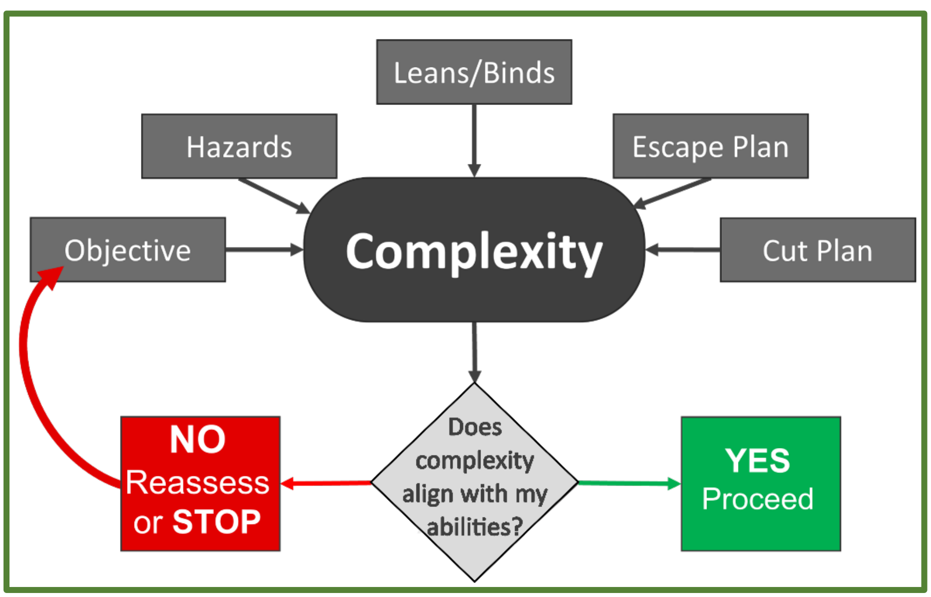


Figure 2.3.38—Complexity flowchart.

Knowledge Check

How do you identify the objective of the felling operation?

How can hazard identification affect your objective?

Define natural lean.

What is the importance of identifying the natural lean of the tree?

Define calculated lean.

What are the different ways you can calculate lean?

When developing your escape plan, what are some elements that you must consider?

What is the purpose of the cut plan?

What are the guidelines for hinge construction?

What are two types of conventional undercuts?

Summary

In this module, you learned how to:

- Explain directional felling.
- Describe the OHLEC size-up process for directional felling.
- State how you identify the objective of a felling operation.
- Identify common hazards for directional felling.
- Identify the natural lean of a tree.
- Explain the good side/bad side of a tree.
- Identify the calculated lean of a tree.
- Describe the importance of the escape plan.
- Develop a cut plan.
- Describe the proper use of wedges.

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