USDA Forest Service
National Sawyer Training:
Developing Thinking Sawyers

Student Guide: Classroom

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Module 3.3: Crosscut Saw Directional Felling

Introduction

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).

When felling a tree, you must correctly construct a hinge (the uncut portion of fiber between the undercut and the backcut). The hinge is critical to guiding and controlling the tree into the objective. Directional felling requires planning and involves multiple steps before any cutting begins.

Module Topics

- OHLEC for Crosscut Saw Directional Felling
- Directional Felling Techniques
- The Backcut
- Wedging

Objectives

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

- Describe directional felling.
- Define the lean of a tree.
- Calculate the lean of a tree.
- Describe the good/bad side of a tree.
- Describe the OHLEC size-up process for directional felling.
- Develop and implement a cut plan as a team.
- Explain the proper use of wedges.

Prework Review

Review Questions

What is **directional felling**?

What is the definition for the natural lean of a tree?

What is the definition of the calculated lean of a tree?

OHLEC for Crosscut Saw Directional Felling

First, we will discuss how to use OHLEC to develop a cut plan to direct a tree in a specific direction.

Understanding the relationship of the undercut, the hinge, and the backcut is key to your ability to successfully direct a tree into the intended lay.

OHLEC: Directional Felling

During a felling operation, consider the following when doing 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/binds:** What are the front, back, or side leans in relation to the objective? Where is the good/bad side of the tree?
- **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? Will you need wedges?

Objective

The first step during a felling operation is to identify the objective (where you want the tree to go). This is the heart of felling (figure 3.3.1). Directional felling requires you to have a plan for where you want the tree to land (intended lay) and involves multiple steps before any cutting begins.

Ask yourself:

- Is the intended lay free from obstacles?
- Are there sidehill considerations?
- Are there swamping considerations?
- Am I going to use the log?

Figure 3.3.1—An objective.

Measuring 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 and with two sides having the same length) using your arm, a stick, and your line-of-sight (figure 3.3.2a through 3.3.2d).

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 a tree's height is also beneficial when maintaining cutting area control.

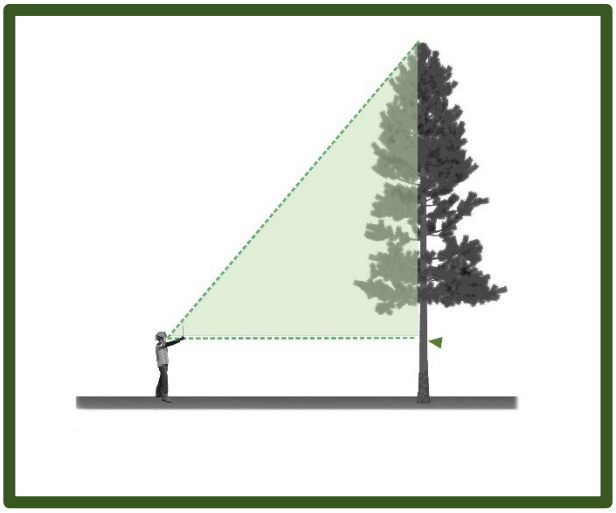

Figure 3.3.2a—Concept for measuring tree height.

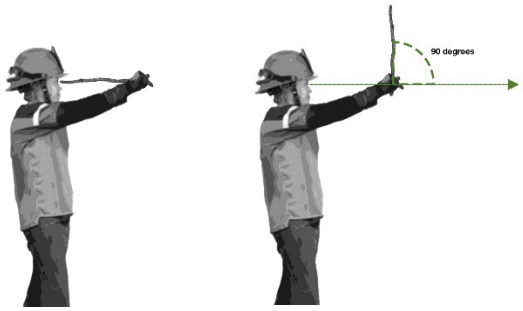

Figure 3.3.2b—Hold the stick perpendicular to your arm.

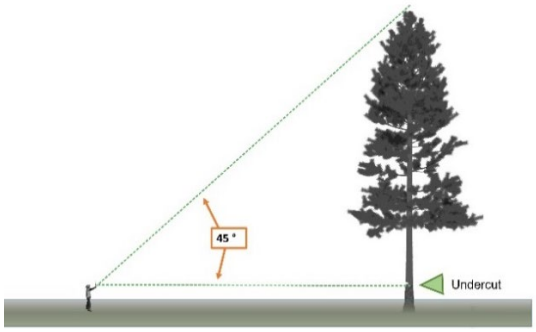

Figure 3.3.2c—Align the stick with the top of the tree and the undercut.

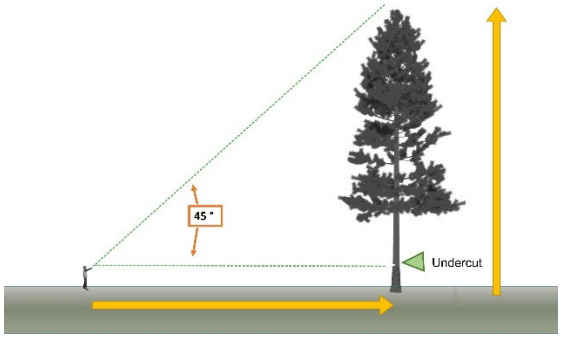

Figure 3.3.2d—The height of the tree is equal to your distance from the tree when you have formed an isosceles triangle.

Procedure for measuring tree height:

1. Hold a straight stick or an ax up to your cheek.
2. Flip the stick 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 logger's 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 what hazards can directly impact you. 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 Indicators of Hazards

Figure 3.3.3—A widowmaker.

Widowmakers: Widowmakers 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 3.3.3).

Figure 3.3.4—A snag.

Snags: Snags are dead or dying trees that pose a risk because wind or vibration can cause them to fall unexpectedly (figure 3.3.4).

Figure 3.3.5—Loose or missing bark.

Loose or missing bark: Loose bark (particularly on trees with thick bark) can pose a significant hazard if it strikes you (figure 3.3.5).

Figure 3.3.6—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 3.3.6).

Figure 3.3.7—A red belt conk.

Figure 3.3.8—Pini conks.

Fruiting bodies (conks): Fruiting bodies on the trunk or bole of the tree can be an indicator of rot. Rot can compromise the strength of the hinge and/or the wedging platform (figures 3.3.7 and 3.3.8).

Figure 3.3.9—A cat face.

Cat faces: A cat face is a defect that may limit the hinge location, wedging platform, or felling direction (figure 3.3.9).

Figure 3.3.10—A canker.

Cankers: Cankers frequently occur on the stems and branches of pines and hardwoods. Canker fungi cause top-kill, branch death, or stem malformation. Other fungi can infect and subsequently decay stem malformations, thus increasing the likelihood of stem breakage, especially during felling (figure 3.3.10).

Figure 3.3.11—Root rot or burned roots.

Root rot or burned roots: As the tree's center of gravity starts to move due to cutting or wedging, or because the tree itself is starting to fall, compromised roots can fail and the tree may fall with the naturally weighted lean, regardless of the hinge placement (figure 3.3.11).

Figure 3.3.12—Uplifted roots.

Uplifted roots: Uplifted roots or a majority of exposed roots are indicators of an unstable tree. The roots could fail and cause the tree to fall prematurely (figure 3.3.12).

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 Lean

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

Natural 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 3.3.13). 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.

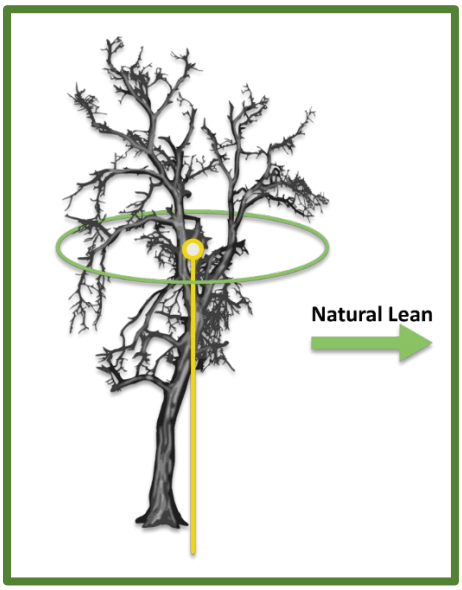

Figure 3.3.13—Natural lean.

Calculated lean: Calculated lean is the amount of front-to-back and/or side-to-side lean (expressed in feet) relative to the objective (figure 3.3.14). Sawyers use calculated lean to develop the cutting and wedging plans that will place the tree into the objective. You must determine which type of calculated lean you have before you can proceed (figure 3.3.15).

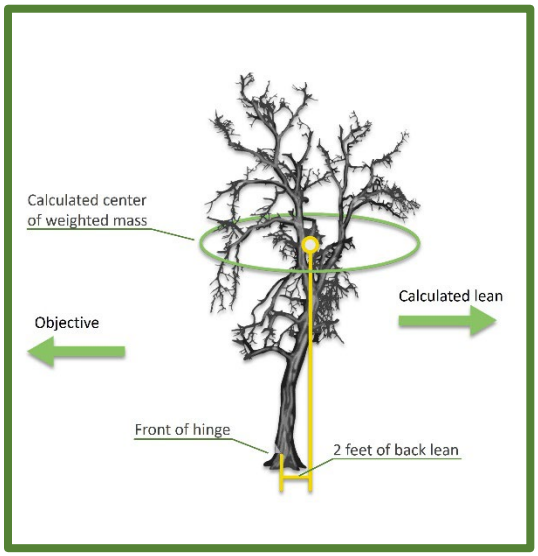

Figure 3.3.14—Calculated lean.

You determine **front-to-back lean** by standing on one side of the tree or the other, perpendicular to and opposite 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.

You 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, you will get the most precise measurement from a tree length away, if possible. Sawyers consider beneath the side lean of the tree to be the **"bad side"**—it is where the tree will fall if you fully sever the hinge.

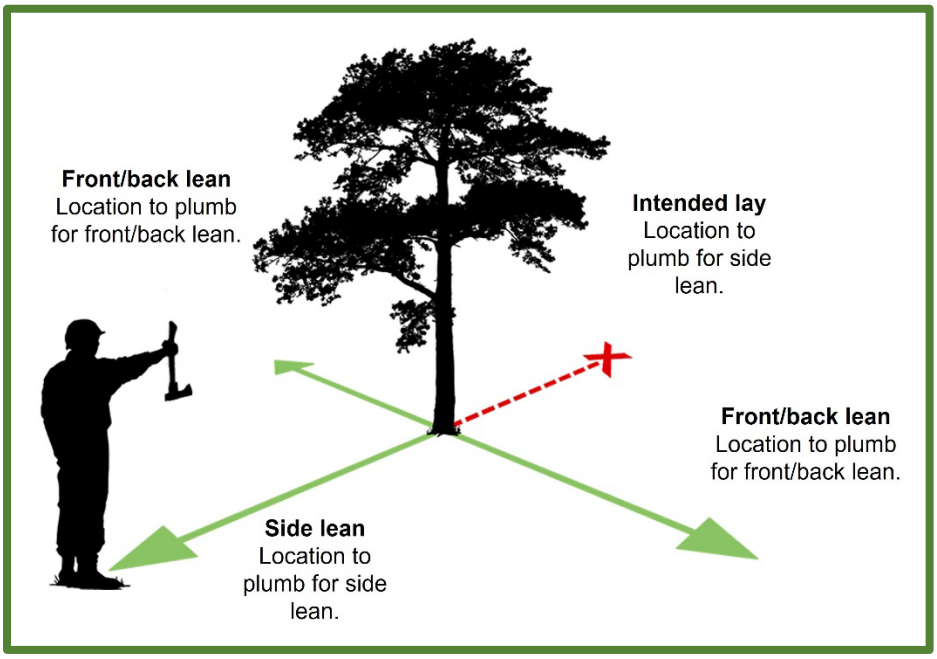

Figure 3.3.15—Types of calculated lean.

Determining the Lean

There are many ways to determine the lean. You can use a straight-handled ax, 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:

- **If 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 away from the center of the tree is the amount of lean.
- **If using an ax**, hold the ax by the handle with the head down. Grasp the ax as far from the head as practical and in such a manner that 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 away from the center of the tree is the amount of lean.

- **If 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 where the combined mass of the bole, limbs, and foliage is located, 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 determines the amount of lean.
- **If using your hands and plumb bob combination,** use your thumbs to hold the plumb bob to eliminate visual error from the hand method (figure 3.3.16).

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

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

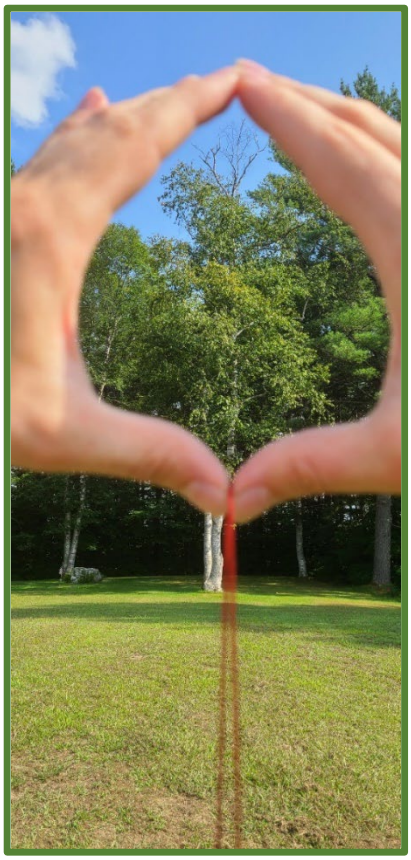

Figure 3.3.16—Determining lean using a hand and plumb bob combination.

Good/Bad Side

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

The bad side of a tree refers to the side under the naturally weighted lean of the tree where the 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 3.3.17). The plan should include determining and clearing an escape path and should also include an alternate path in the event that something unexpected happens.

When possible, you should finish cutting/wedging on the good side of the tree and escape on the good side of the tree as well. Once the tree begins to fall, you should immediately move a safe distance away while paying attention to the falling tree and surrounding canopy.

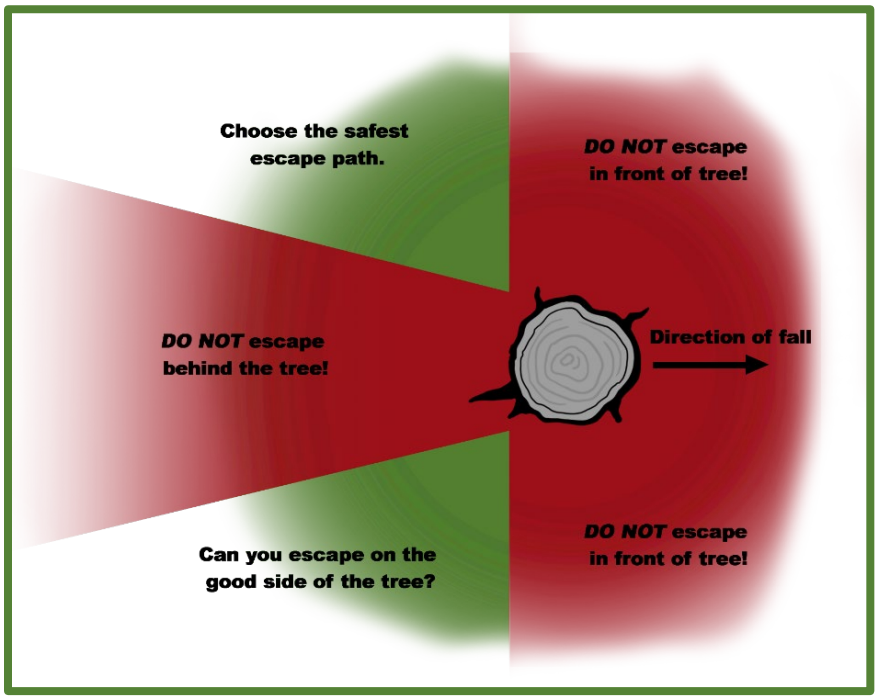

Figure 3.3.17—An escape plan.

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 determines the type and sequence of cuts that will ultimately guide the tree into the objective.

The cut plan accounts for the objective, hazards, leans/binds, and escape plan. It is the final step in OHLEC and is how you tie together the plan elements of the size-up process. 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 the wedges needed and the sequence for setting the wedges.

Video: OHLEC for Directional Felling

Next, you will watch a video that demonstrates OHLEC for directional felling and then discuss your questions with the instructor and other students.

Cut Plan Development

The elements for developing the cut plan are the hinge, undercut, wedging plan, and backcut.

Hinges

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 3.3.18): the undercut, the hinge, and the placement of the backcut.

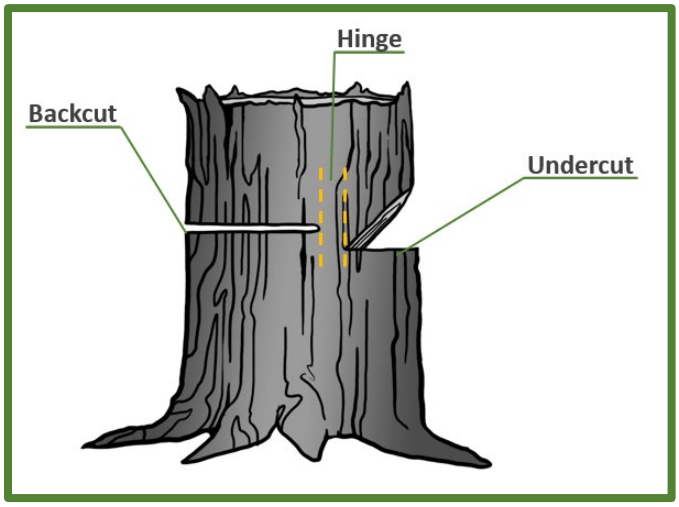

Figure 3.3.18—The anatomy of a hinge.

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 3.3.19). The 80+ percent/10− percent provides guiding metrics to initially determine the desired hinge length and width required during a felling operation. The 80 percent refers to the hinge length (distance across the stump) and the 10 percent refers to the hinge width (front to back).

You express these metrics as a percentage of the tree diameter at breast height (DBH, 4½ feet above the ground).

Targeting a minimum hinge length of 80 percent of the DBH reduces the chance of overcutting the diameter of the bole and allows for a greater margin of error when trying to match cuts.

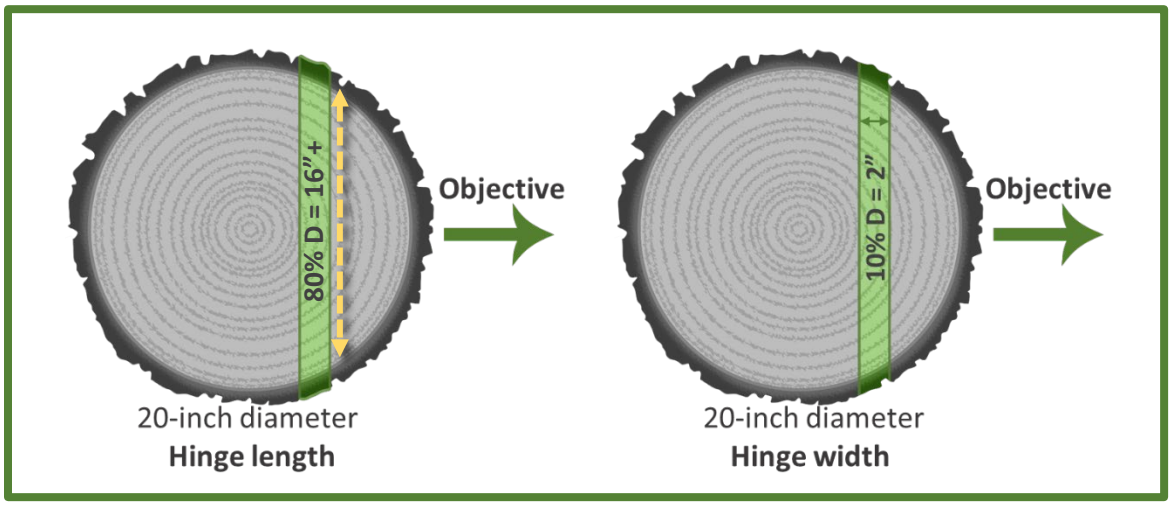

Figure 3.3.19—Hinge design.

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 the DBH. Both these metrics depend on tree conditions and you may need to change them, depending on tree species, wood fiber condition, and lean. On trees with a 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 can also play a role when wedging. A hinge located more on 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 require more effort to lift the tree.

Considerations for placing a hinge:

- **Shape of the bole:** 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. Locating for maximum hinge length can also be useful for increasing hinge holding power.
- **Stobs:** Stobs are trees with missing and broken off tops. 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. Sawyers almost always fell stobs in the direction of the natural lean. A deeper undercut (near 100 percent hinge length) is preferable to using excessive wedging to fell a stob. The deeper undercut also moves the center of gravity forward (toward) the objective.
- **Lean:** A side lean is generally more difficult to control than a front or back lean. Always plan to increase the 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 slab size for a triangle backcut (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.

Video: Hinges

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

Fiber Characteristics

Fiber tensile strength and flexibility vary greatly by species. Knowing the characteristics of the tree fiber you are working with is critical to constructing the hinge. The decay profiles for the boles of different species are also a relevant consideration.

Sounding

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

Note that different tree species will sound different because of their differing fiber densities:

- 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.

Remember! Observe overhead hazards and look up often.

Though sounding is a valuable tool 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.

Undercuts

An undercut is the removal of a wedge-shaped section on the front part of the tree that you plan to fell. The undercut forms an opening (notch) in the bole to set the front portion of the hinge. The three types of undercut are conventional, Humboldt, and open (figure 3.3.20):

- **Conventional undercut:** An undercut made with a 45-degree opening with the sloping cut on the top. This method originally came from using axes to chop out the undercut. The conventional undercut is the hallmark of crosscut sawyers because the crosscut saw cuts across the grain and the ax cuts at a 45-degree angle, thus creating the conventional undercut.
- **Humboldt undercut:** An undercut made with a 45-degree opening with the sloping cut on the bottom. Sawyers often use this method when working on steep ground. This method can also make removing large undercuts easier when felling large-diameter trees.

- **Open-face undercut:** An undercut made with a 70-degree or greater opening angle. A wider undercut enables the tree to stay attached to the stump longer.

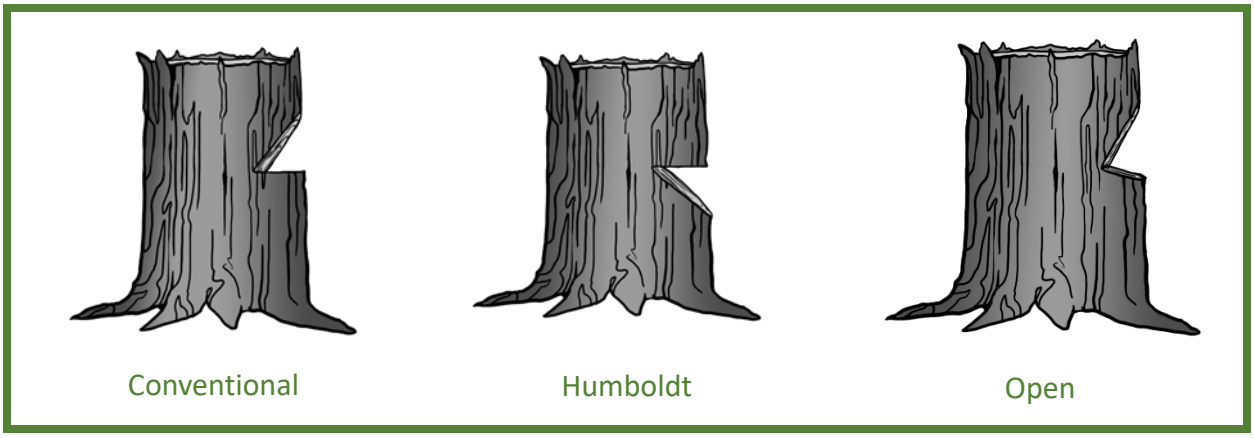

Figure 3.3.20—Types of undercut.

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 3.3.21). 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 of the tree and the conditions of the tree.

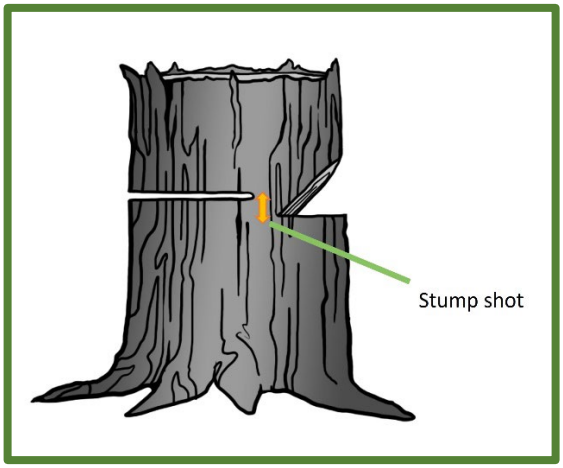

Figure 3.3.21—A stump shot.

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. You will use this distance to offset your aim (figure 3.3.22).

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. Be sure to make the backcut on the **good side** of the tree when possible.

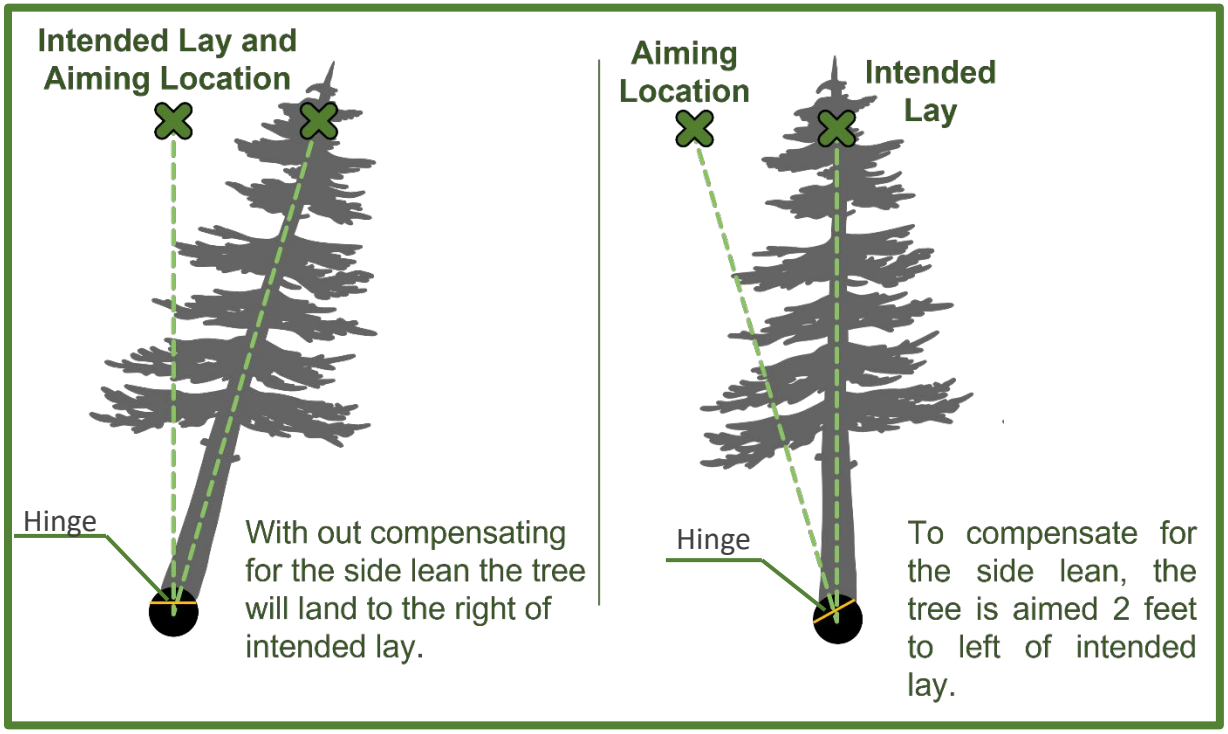

Figure 3.3.22—Compensating for side lean.

Wedging Plan

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

Sawyers use wedges to drive the kerf apart and guide the bole of the tree into the objective, They typically carry two or more wedges with them, depending on the task at hand.

The wedging platform(s), or the area(s) you intend to place wedges, must be solid. If rot or thick bark are present where you intend to insert the wedges, the fibers will compress and the wedge will not be able to lift the tree. This could allow the tree to sit back on the saw or not fall into the objective.

Planning to place wedges adjacent to each other and striking them alternately is an efficient wedging method that uses the least amount of effort.

Wedge Techniques

- **Crossing/stacking wedges:** In situations where you need more than one wedge to overcome a back lean, stacking wedges becomes necessary. It is a common practice to cross wedges to lessen the likelihood of a wedge popping out when struck. Stacking two 1-inch wedges doubles the amount of lift. Do not create a wedging plan where you need to stack more than two wedges.
- **Indicator wedges:** You can place a wedge in the kerf of the backcut to help visualize tree movement. This is known as an indicator wedge. Planning for an indicator wedge is useful when you have a forward lean.

Trees with Back Lean

You can use wedges and cutting techniques to redirect trees that lean opposite the intended felling direction (figure 3.3.23).

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 3.3.23—A tree with back lean.

Barberchairs

A barberchair is an explosive release of wood fibers under tension and results in a vertical split of the tree bole (figure 3.3.24):

- 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 project 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 leaners or a poorly constructed undercut can cause a barberchair.

Figure 3.3.24—A barberchair.

Considerations/mitigations:

Reducing the amount of wood fiber under tension reduces the likelihood of a barberchair. Two methods for reducing wood fiber under tension are:

- Wrap the trunk with heavy rope or chain above the undercut to prevent the tree from splitting vertically.
- Use the triangle method (the instructor will discuss the triangle method in class).

Backcut

The backcut is the final cut to isolate the hinge and fell the tree. There are different methods for executing 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 evenly toward the undercut (figure 3.3.25). Make sure you construct the cut parallel to and slightly above the undercut's hinge to create the necessary stump shot for this method.

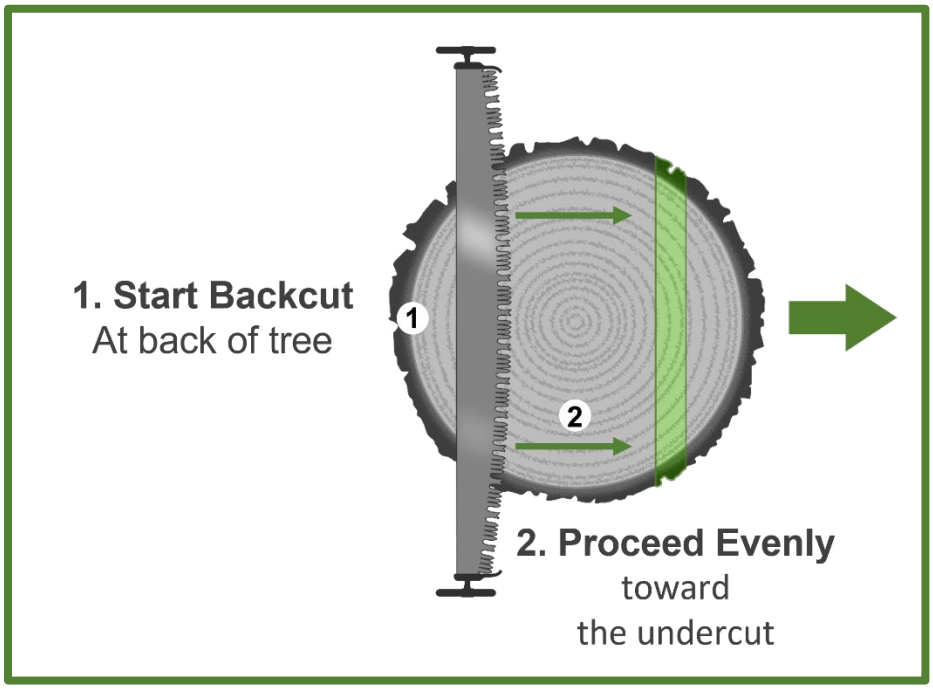

Figure 3.3.25—A conventional backcut.

- **Triangle backcut:** This is a special form of backcut that sawyers use when felling trees with significant forward calculated lean to help prevent the possibility of a barberchair (figure 3.3.26). The triangle backcut is effective in providing additional safety by allowing you to cut quickly to the desired hinge thickness. Because this backcut involves additional complexity and skill, you should master the conventional backcut first and then work with a qualified sawyer to master the triangle backcut.

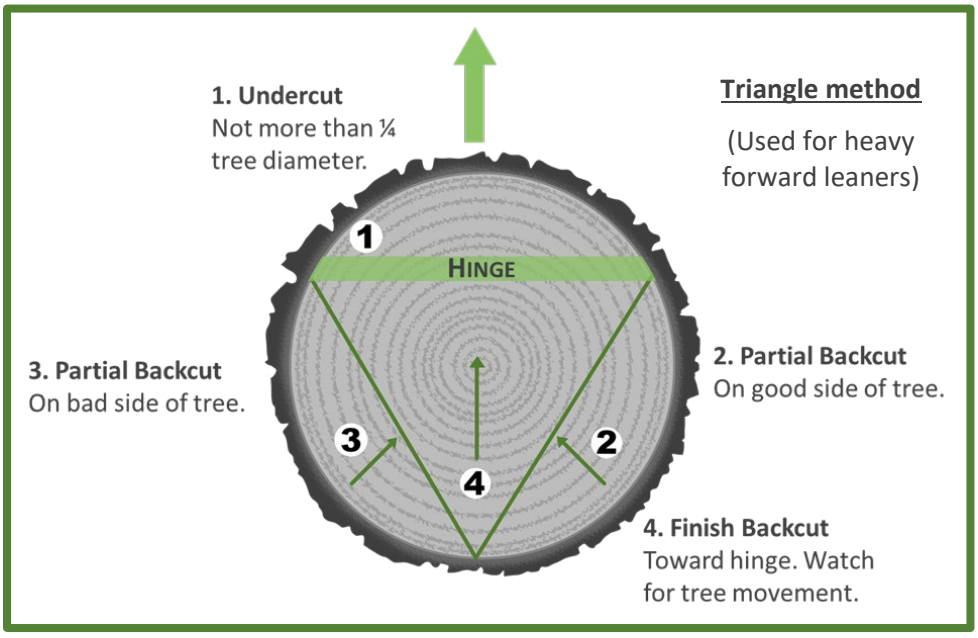

Figure 3.3.26—A triangle backcut.

In either case, focus on the goal of constructing a hinge with the desired width evenly across the stump.

Implementing the Cut Plan

The instructor will discuss the elements of the cut plan, which include communication, body positioning, making the undercut, aiming for the objective, making the backcut, driving wedges, felling trees with back lean, and escape.

Communication

A hallmark of any good crosscut sawyer or saw team is fun, effective, and efficient communication. The work is often challenging, so keep your attitude light but serious and in team with each other (figure 3.3.27).

If communication breaks down due to fatigue, dehydration, hunger, lack of understanding, disagreement, etc., you should cease all sawing operations until you can restore good communication and team.

Figure 3.3.27—The sawyer communication dynamic.

For each tree, one sawyer should take the lead in orchestrating the implementation of the cut plan. This is the primary sawyer. Often, the most experienced or qualified sawyer assumes this responsibility for the first tree, then sawyers take turns with the lead responsibility as the complexity of each tree allows. In this way, both sawyers can learn from each other, regardless of their prior experience.

It is the primary sawyer's responsibility to maintain cutting area control and aim the cut. The primary sawyer should be the last sawyer to leave the tree as it commits to the lay. For a tree with a forward lean, the primary sawyer will remove the saw during the escape. For a tree with a back lean, the secondary sawyer escapes with the saw just before the primary sawyer drives the wedges to complete the felling operation.

The primary sawyer should also establish the **zero** marks on the tree for hinge width and any tick marks deemed necessary to facilitate smooth communication to complete the backcut. The need for tick marks depends on the comfort level of the sawyers, but they are always a good idea for maintaining consistent communication.

The secondary sawyer should assist with good feedback and communication while striving to provide additional eyes for safety and cutting area control. The secondary sawyer is critical to aiming the tree and must hold the saw in place while the primary sawyer determines the sight lines.

Depending on tree size, both sawyers can take turns chopping out the undercut, usually with the primary sawyer making the final adjustments as the saw team completes the undercut.

Body Positioning

Both sawyers should strive to maintain good body position to orchestrate smooth, even pulls on the saw and develop a comfortable back-and-forth rhythm using their legs and torso as much as possible (figure 3.3.28).

Figure 3.3.28—Proper body position.

Ideally, both sawyers should be about the same height and size. When this is not possible, the sawyer with longer limbs must accommodate shorter pulls and position themselves to take advantage of any slope (if possible). Both sawyers should be proficient at sawing or chopping with either hand to reduce overuse injury risk and increase stamina.

The Undercut

To start an undercut, make a horizontal cut and aim it toward the intended lay (figure 3.3.29). Do this by holding the saw so that the teeth in the center point directly away from the aim point. Aim the saw a couple of times without cutting to set your footing, saw elevation, and the pulling distance between you and the other sawyer. Ensure that the center of the saw passes equal distances on either side of the tree's center and that you and the other sawyer can keep the saw level at the cut.

Figure 3.3.29—Making an undercut.

Begin cutting with very light pressure until the saw establishes a kerf deep enough to hold the teeth. Now is the time to stop and check your aim.

In special circumstances when overhead hazards may be sensitive to vibrations from chopping out the undercut, consider sawing out the undercut instead.

Aiming for the Objective

Aiming for the objective is the way you fell a tree using a crosscut saw. Aiming a tree correctly requires you to choose an objective to aim for.

The most effective way of aiming with a crosscut saw is to flip the saw in the aiming cut, stand about 5 to 7 feet behind the tree, and look down the teeth on the right and left sides of the tree (figure 3.3.30). The teeth on the right will face to the right of the aim/target. The teeth on the left will face to the left of the aim. Take the average of the two sighted aims to determine the aiming sight.

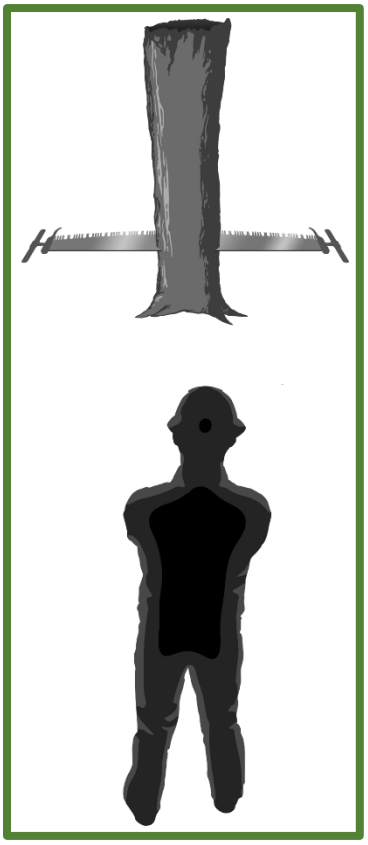

Figure 3.3.30—Aiming.

Example: Assume a straight tree where the top of the tree aligns with the center of the bole and estimate the distance from the center of the bole to the aiming site.

The distance you determine will become the same offset distance you will use to identify an aim point parallel and adjacent to the intended lay. When possible, the aim point should be roughly as far away from the base of the tree as the tree is tall.

Aiming, in conjunction with forming a hinge when felling a tree, will provide the direction in which the tree will fall.

While sighting, it is critical that the saw remain in contact with both corners of the cut, and that the secondary sawyer maintain this contact.

If the secondary sawyer thinks the saw has slipped, you can check the position by gently rocking the saw side to side in the cut while holding slight pressure against the tree. The saw will pivot from either corner as it makes contact, allowing the secondary sawyer to gauge full contact with both corners.

The primary sawyer can then determine the true aim point by taking the average of the two sighted aims. If you aim the cut correctly, the teeth on the right will be aimed to the right of the aim point the same distance that the teeth on the left will be aimed to the left of the aim point.

Continue cutting and repeating the aiming process until the front of the hinge is set with the desired hinge length.

Chop or saw out the remaining portion of the undercut, taking care not to chop deeper than the aiming cut, until both cut surfaces meet exactly along the length of the hinge.

Making the Backcut

Begin the backcut in a similar manner to the undercut. Elevate the saw slightly above the aiming cut to allow for a stump shot (figure 3.3.31).

As a saw team cuts, they will talk to let each other know where they are in relation to their desired hinge.

Example:

Secondary sawyer: "2 inches until zero."

Primary sawyer: "3½ inches to zero, hold your place and we will cut on my side until I catch up."

This enables the saw team to come into the designated hinge at the same time. The saw team stops cutting at the predetermined spot that follows the 80+/10- guideline. The desired hinge thickness is the **zero** mark on the tree.

Figure 3.3.31—Making the backcut.

Both sawyers must use the same terminology and cut mirrored portions of the tree during the backcut. Creating marks (knife, marker, grease pencil, etc.) behind the hinge can be helpful because the sawyers can only see one side of the tree.

The saw team will continue this communication until the tree falls with an even hinge or until both sawyers hit their predetermined zero mark. If the operation requires wedges, the secondary sawyer walks away with the saw, and the primary sawyer wedges the tree into the objective.

As you progress making the backcut, look and listen to detect changes in the tree as you create the hinge. Placing a long indicator wedge in the center of the backcut to detect subtle movement is a good idea.

You may hear loud cracking noises as gravity or wind start to move the tree. This noise and/or the beginning of steady indications of wedge movement are your clues to glance down your intended escape path for the last time to orient your next move.

Note: If backcutting solo, you should pay special attention to the offside of the tree so that you do not inadvertently cut off the hinge or leave it too wide. Become familiar with using the saw's teeth and handles to help align the backcut while periodically stopping to double check for accuracy.

Driving Wedges

Follow your wedging plan as you begin to place and drive your wedges (figure 3.3.32). Drive wedges by striking them squarely on the head with the poll of your ax, but drive them carefully to prevent them from flying out of the kerf when you strike them.

As you drive a wedge into the kerf, the force that develops 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 knock loose.

- **If crossing/stacking wedges,** it is a common practice to put sawdust or duff/dirt between the wedges to lessen the likelihood of the wedges shooting out when you strike them.
- **If using an indicator wedge,** as soon as possible, place just the tip of the wedge into the kerf. Continue with the backcut. A wedge that starts to drop indicates that the kerf is opening and the tree is beginning to fall.

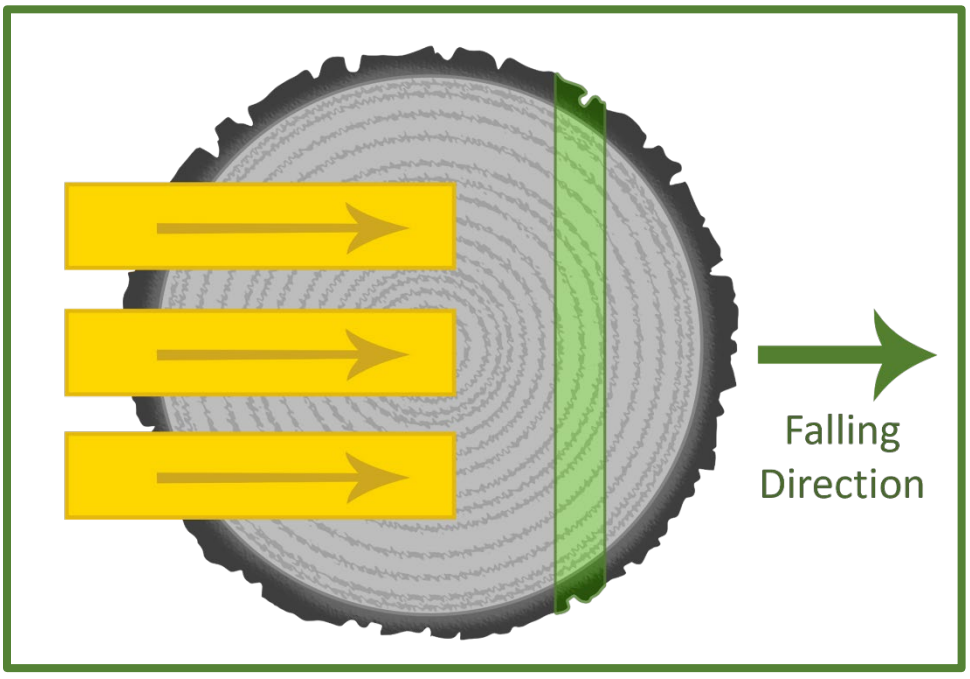

Figure 3.3.32—Multiple wedges.

Escape

Once the tree is committed to moving, make a quick but methodical retreat along the predetermined escape path (figure 3.3.33). Keep an eye on the moving canopy during your escape.

Remember, the primary sawyer should be the last sawyer to leave the tree as it commits to the lay. For a tree with a forward lean, the primary sawyer will remove and carry the saw during the escape. For a tree with a back lean, the secondary sawyer will escape with the saw before the primary sawyer completes the felling operation. If the saw hangs up in the kerf as the tree commits to the lay, leave the saw behind during your escape.

Figure 3.3.33—A sawyer following an escape path.

Operational Complexity: Putting it All Together

Complexity is a characterization of the cutting operation and the elements you must manage while implementing it. The complexity will also determine the level of knowledge, skill, experience, and certification you will need.

Complexity is not managing the risks of the operation, but rather how you will 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.

Managing the complexity of a cutting operation is like driving a car. Many different elements influence the complexity of a driving situation. For example, when driving a car, you may ask yourself:

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

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

As a sawyer, you must do the same thing.

Once you have completed the OHLEC size-up process, you must determine if you have the knowledge, skill, and experience, to manage the complexity of the cutting operation. If the complexity does not align with your abilities, go back and reassess your objective (figure 3.3.34).

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 and see if your head is in the game.

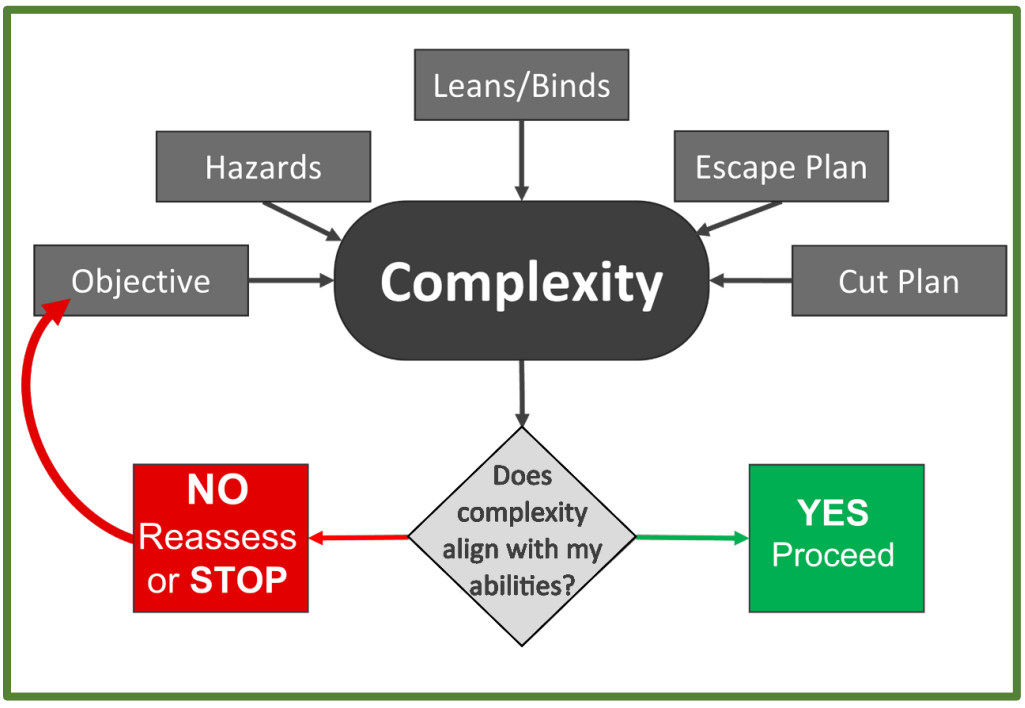

Figure 3.3.34—The complexity flowchart.

Knowledge Check

Take a few moments to answer the questions below, and then discuss the answers with your instructor and the class.

What are three considerations for safe limbing?

What questions should you ask when performing your OHLEC size-up assessment?

Provide four examples of hazard indicators.

What is the good/bad side of a tree?

Explain the 80+ percent/10- percent guideline.

What are two types of backcuts and when do you use them?

Summary

In this module you have learned to:

- Describe directional felling.
- Define the lean of a tree.
- Calculate the lean of a tree.
- Describe the good/bad side of a tree.
- Describe the OHLEC size-up process for directional felling.
- Develop and implement a cut plan as a team.
- Explain the proper use of wedges.

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