

# USDA Forest Service National Sawyer Training: Developing Thinking Sawyers



## Student Guide: Classroom

**USDA Forest Service National Sawyer Training:  
Developing Thinking Sawyers**  
Module 3.2: Crosscut Saw Limbing and Bucking

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## Module 3.2: Crosscut Saw Limbing and Bucking

### Introduction

Module 3.2 covers limbing and bucking techniques using a crosscut saw. The instructor will first present concepts in the classroom and will follow up with demonstrations. You will then practice these techniques in the field under controlled and supervised conditions.

### Module Topics

- Limbing
  - OHLEC (objectives, hazards, leans/binds, escape plan, cut plan)
  - Spring poles
- Bucking
  - OHLEC
  - Mitigating risks
  - Binds
- Types of cuts
  - Straight, compound, offset, and chopped
- Saw protection

### Objectives

In this this module, you will learn to:

- Explain the importance of saw team communication.
- Define brushing and limbing.
- Identify proper limbing techniques.
- Identify the different types of binds.
- Describe a bucking plan and techniques.

### Prework Review

#### *Saw Team Communication*

A hallmark of any good crosscut sawyer or saw team is fun, effective, and efficient communication. The saw team must understand the cut plan and associated hazards, and all members of the team must be on the same page to work efficiently and safely. If communication breaks down (from fatigue, dehydration, hunger, lack of understanding, disagreement, etc.), the saw team should cease all sawing operations until good communication and team can be restored. Accidents are most prone to happen in the afternoons when energy is low and decision making is strained.

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*Brushing*

Brushing involves cutting material, whether it is light, grassy material or smaller, woody material, such as branches. In the context of crosscut bucking work, sawyers use brushing to clear around the base of the log where cutting happens.

Nonmotorized tools that facilitate brushing often include lopping and pruning shears and brush hooks. In some cases, sawyers use clearing knives or Swedish brush axes.

Lopping and pruning shears are similar in design and use, though lopping tools have longer handles designed to improve reach. Cutting edges also vary; one blade binds and cuts a stem against an anvil or beveled hook. For smaller diameter limbs, lopping shears sever branches cleanly and flush with the material the sawyer plans to cut.

**Brushing**

Brushing is the severing of small-diameter stems. Often you will find multiple small-diameter stems, such as shrubs or regeneration (material smaller than 5 inches in diameter), growing together or in clusters, and brushing is the most effective way to remove them.

*Review Question*

Why is communication important when working as a saw team during crosscut bucking operations?

Why is accurately assessing binds important for a crosscut bucking operation?



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## Limbing

Limbing is severing limbs from the main stem/bole of a tree. A sawyer may use limbing when the tree is standing vertically or lying on the ground. Removing limbs from trees that are not anchored may cause the tree to roll or move.

### OHLEC: Limbing

It is important to determine the stability of the tree when planning a limbing operation. Limbing safety and efficiency requires adjusting constantly, focusing on cutting one limb at a time, and implementing OHLEC.

During a limbing operation, consider the following when doing your OHLEC size-up:

- **Objective:** Where do I want the limb to go?
- **Hazards:** What hazards exist? Are the hazards overhead or on the ground? Is the tree anchored in place?
- **Leans/binds:** Which direction does the limb lean or is it under compression/tension?
- **Escape plan:** Where is my escape path in relation to where I expect the limb to go? Where will I go when the log moves or rolls? Escape paths can and will change as more limbs are cut.
- **Cut plan:** What type, location, and sequence of cuts will I use?

### Traditional Tools

An ax is an incredibly functional tool for removing limbs from downed trees. Removing limbs with an ax often takes one or two swings and is much more efficient than limbing with a handsaw. Ax handling is taught in detail in Module 4: Ax Basics, Maintenance, and Use.

### Spring Poles

Spring poles are small trees or limbs which are bent over and under pressure (figure 3.2.1). Cutting them in the wrong location can cause a sudden release of energy which could severely injure you.

The safest way to handle spring poles is to avoid them. If you must release one, try to release it slowly. The best way to do so is to cut a series of parallel cuts at the apex of the bend on the underside of the spring pole. This allows the wood fiber on the top side to bend and release energy slowly.

To determine the optimum point of release:

1. Identify a straight vertical line from the stump to where it meets a straight, horizontal line from the highest point of the bend.
2. Draw an imaginary line at a 45-degree angle from where the two lines intersect.
3. Slowly make your parallel relief cut with a handsaw on the inside of the arc at the maximum point of compression.

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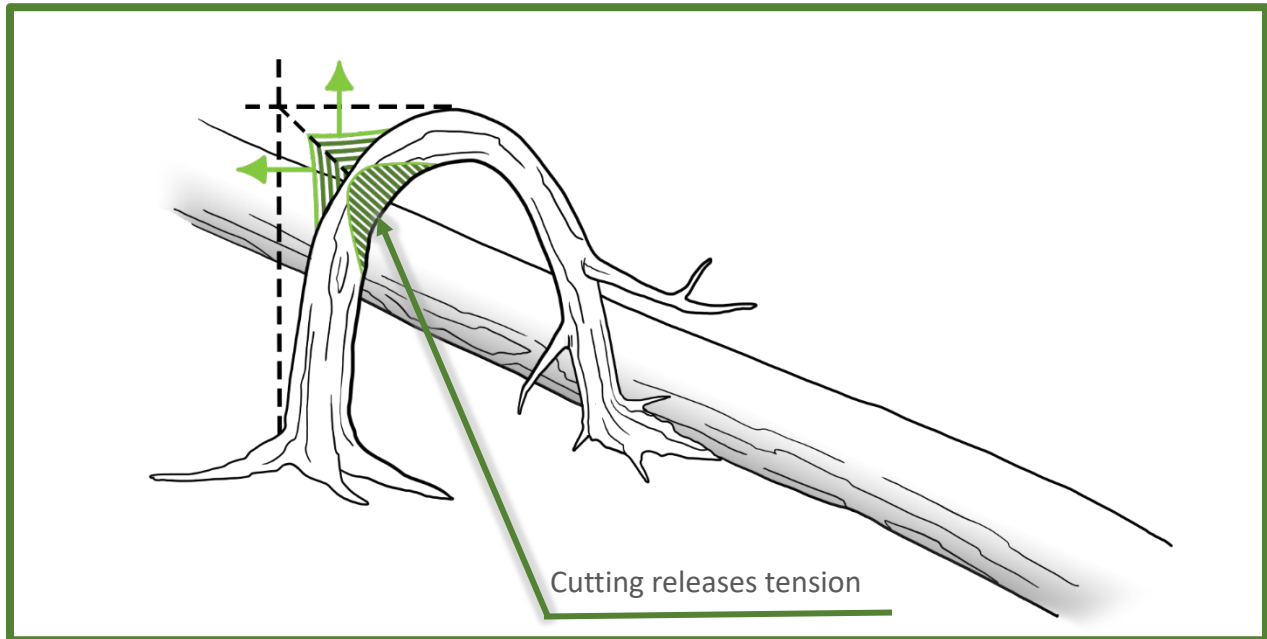


Figure 3.2.1—Spring pole.

Watch for the release of tension and be careful not to cut all the way through the stem. The end result will be a 90-degree angle between the trunk and the stem that has little or no remaining tension/compression. At this point, the fiber on the tension side will still connect the pieces, which you can then cut through for removal.

### Bucking

Sawing longer logs into shorter lengths is known as bucking. It is important for you to consider the stability of the tree that you need to buck. You must also consider the effort of log removal, its end use, and the task at hand when deciding how big to buck the pieces.

**IMPORTANT!** Be aware that the dangers associated with bucking can be equal to or greater than those present during felling operations.

### OHLEC: Bucking

Bucking involves asking the following questions:

- **Objective:** Where do I want the bucked section of log to go?
- **Hazards:** What hazards are present?
- **Leans/binds:** Are there pivot/contact points? On what side is the tension and/or compression?
- **Escape plan:** Do I expect the log to move? Where is a safe place to stand, or go once I make the cut?
- **Cut plan:** What type, location, and sequence of cuts will I use?

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### Bucking for Efficiency

You can often avoid unnecessary work with good planning in the cut plan of your OHLEC size-up process. Ask yourself questions such as, will I need to:

- Place runners across the tread?
- Cut in different locations?
- Use a lever to roll the log?
- Chop instead of saw to avoid a bind?
- Use wedges in tandem to alleviate severe top bind?

These are all things that you will learn as you gain experience. The more information you gather from the O-H-L-E parts of the size-up process and apply to the cut plan, the more efficient you will be when you begin cutting.

### Mitigating Risks

Here are some important tips to mitigate risk:

- Evaluate the entire length of the tree to determine contact/pivot points.
- Work on the uphill (good) side of logs whenever possible. If working on the downhill (bad) side, make sure the log is chocked or otherwise stabilized.
- Identify tension/compression and know where to stand when the cut is finished.
- Determine the initial stability of the tree.
- Understand that if the stability of the tree changes, new areas of tension and compression may develop.
- Consider the need to secure the bucked section to prevent movement or rollout (steep slopes).
- Maintain secure footing, proper body position, and saw handling.
- Understand that logs with attached root wads may stand up while or after you buck them.

### Escape Plan

Having an escape plan is critical for your safety and the safety of those around you.

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*Working in Tandem*

In a bucking operation there are four locations where you can position yourself relative to the cut (figure 3.2.2). Sometimes all locations are safe, and two people can buck the log to completion standing anywhere around the log. Other times, due to log rollout, only one side of the log will be safe, and only **one** sawyer must make or finish the cut.

Whether you are sawing alone or in tandem, you need to determine a good location from where to make your cut. Often both sides of a log will be safe, and it is safe to have two sawyers finish the cut together. Sometimes you must finish a cut sawing with your nondominant hand to allow the tree to move past where you are standing.

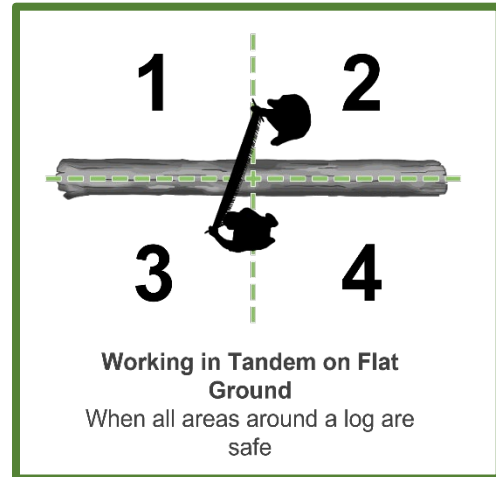


Figure 3.2.2—Working in tandem.

*Steep Hill*

Here is a diagram of a log that needs to be bucked (figure 3.2.3). Uphill on either side of the cut is safe because the log cannot roll uphill. On the downhill side of the log, you could operate near the live standing tree if you choose because the tree would protect you from any potential log rollout. Here, there are three safe locations to operate from and one unsafe location.

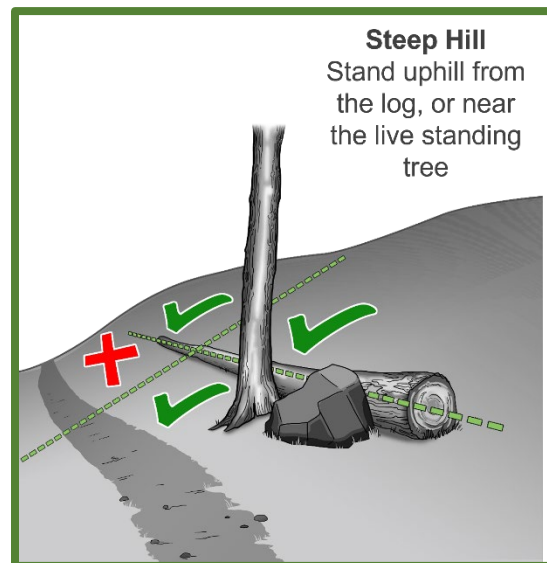


Figure 3.2.3—Working on a steep hill.

*Binds*

It is not a question of if but when and where your saw will get stuck in a bucking operation. Landforms, stumps, blowdown, and other obstacles that prevent a log from lying flat cause binds. A log with a bind has areas of tension and compression (figure 3.2.4).

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The **tension area** is the portion of the log where the wood fibers are being stretched apart. In this portion of the log, the crosscut saw's kerf opens as the sawyer makes the cut. The other pressure area is called the **compression area**. Here the wood fibers push together. In this portion of the log, the kerf closes as the sawyer makes the cut. It is critical to identify binds before you create a cut plan, as the type of bind determines the bucking techniques and procedures you will use.



Figure 3.2.4—Tension versus compression.

There are four types of binds we will discuss next—top, bottom, side, and end. Normally, logs have a combination of two or more binds.

*Top Bind*

In a **top bind**, the tension is on the bottom of the log, and the compression is on the top (figure 3.2.5).

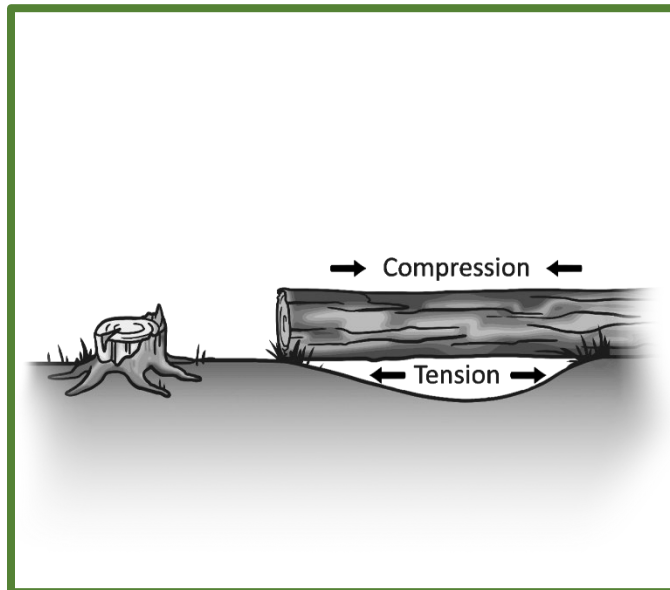


Figure 3.2.5—Top bind.

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*Bottom Bind*

In a **bottom bind** the tension is on the top of the log, and the compression is on the bottom (figure 3.2.6).

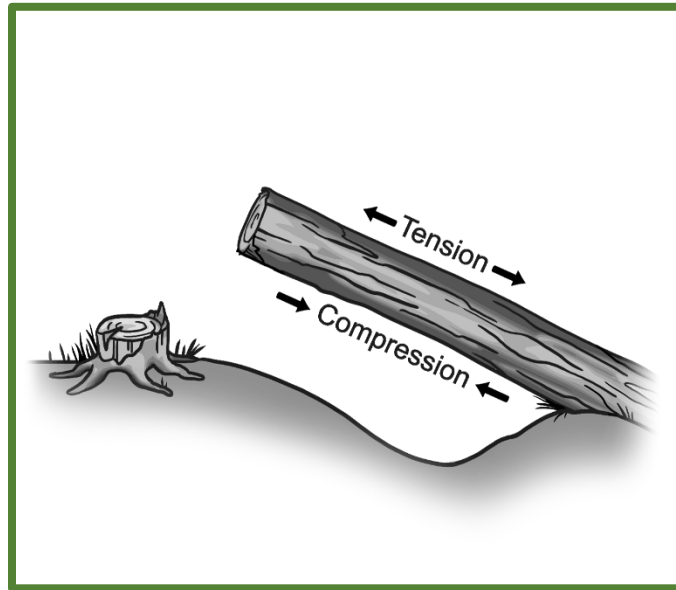


Figure 3.2.6—Bottom bind.

*Bottom Bind: Slabbing Out*

You may intuitively choose to tackle a log with a bottom bind with a straight down cut because the kerf will naturally open as the saw progresses through the log. However, on a log with a significant bottom bind, this will often result in **slabbing out**, if you do not cut the compression first. Slabbing out refers to the cut piece of a log (the slab) falling away with the crosscut saw still engaged in the tree.

This can be problematic for two reasons:

1. If the log slabs and the saw stays connected, the log may roll sideways enough to pinch the saw in the kerf. Even if you can remove the saw, finishing the cut in this circumstance can be difficult.
2. If the slab breaks away from the log, a rolling log may grab the saw and pull it out of your hands.

When severing a log with a bottom bind, you will most often use two cuts in tandem:

1. Make the first cut from the bottom (bind) side and sever a minimal amount of wood fiber. The depth of this first kerf is typically only 1 to 3 inches and is commonly referred to as **cutting the lazy strap**, because a lazy sawyer will not cut it.
2. Make the second cut (which aligns with the first cut) from the top, which causes the log to break cleanly.

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*Side Bind*

In a **side bind**, tension is exerted sideways on the log. This often creates a dangerous situation. The side-bound log has tremendous potential to move fast with great force toward the tension side of the log when severed (figure 3.2.7). It is very important to cut side-bound logs from the safe (or good) side of the tree.

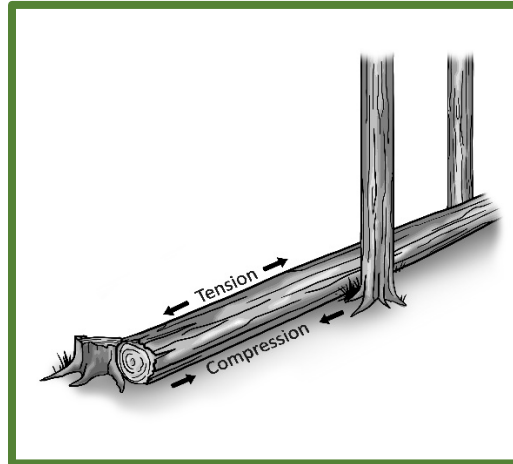


Figure 3.2.7—Side bind.

*End Bind*

In an **end bind**, weight compresses the entire cross section of the log (figure 3.2.8). Here, there is potential for the kerf to close with any cut you select. Wedges are imperative. Always be aware that the uphill side of the log could move or roll as the sawyer makes the cut. Consider finishing the cut with only one sawyer on the good side of the log. If the log does not have a clear good side, consider bucking with a slight angle cut to create a good side where the top section cannot roll.

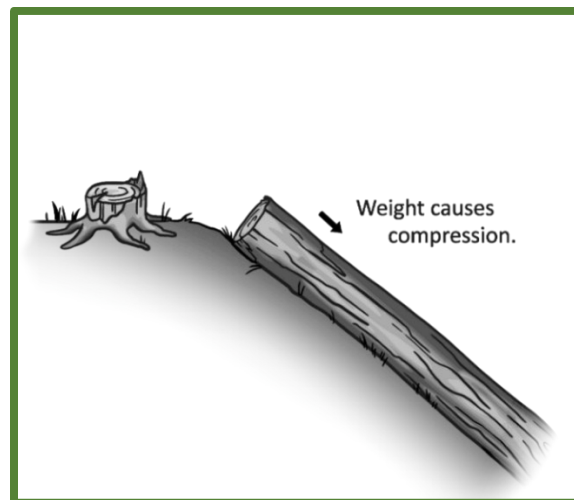


Figure 3.2.8—End bind.

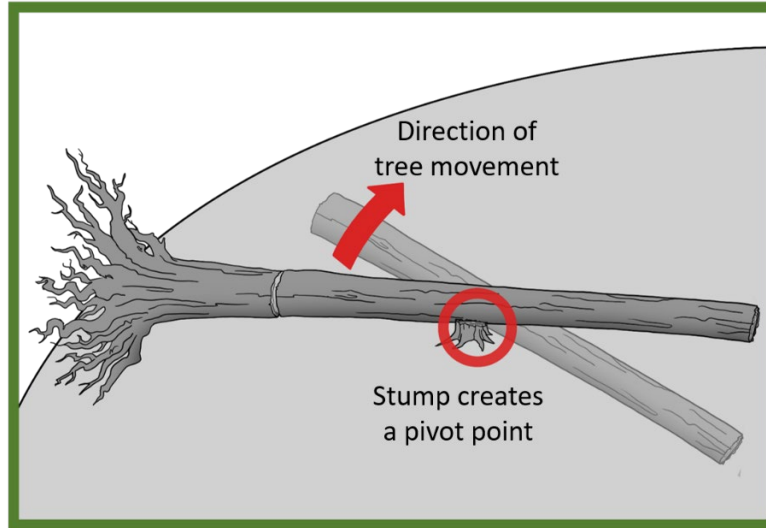
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### Pivot Points

Pivot points are ground features, such as stumps, rocks, and logs, that may cause a bucked log to react in an unexpected manner (figure 3.2.9). Most often these are encountered while bucking and can be dangerous if they are not recognized beforehand.

An unnoticed pivot point may cause one end of a log to roll or shift. Injury can result if you do not see or plan for log movement.



**Figure 3.2.9—Pivot points.**

### Cut Plan

Form your cut plan with efficiency in mind. Most logs must be cut twice to reach the objective. There is usually one side that will make the cutting operation easier if you start with that cut first. Assess the current binds of the log. Consider what will happen when you sever either side of the log first. Will the second cut be easier or harder to make after the first? The goal is to cut from the top down twice as underbucking is more difficult and is not as efficient.

#### **A cut plan includes:**

- Use of wedges
- Number of sawyers
- Location(s) of sawyer(s)
- Necessary tools
- Best saw for the operation
- Hazard mitigation
- Limbing as necessary
- A plan to move the log into its objective (roll, levers, flip, drag)
- Order of cuts
- Best saw for operation



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## Types of Cuts

There are four basic types of cuts used in bucking operations with traditional tools—straight cut, compound cut, offset cut, and chopped cut (using an ax to chop through the log).

### Straight Cut

A **straight cut** is one kerf cut from one side of the limb that completely severs the limb (figure 3.2.10). Sawyers most often use this cut when binds are minimal and easily observed.

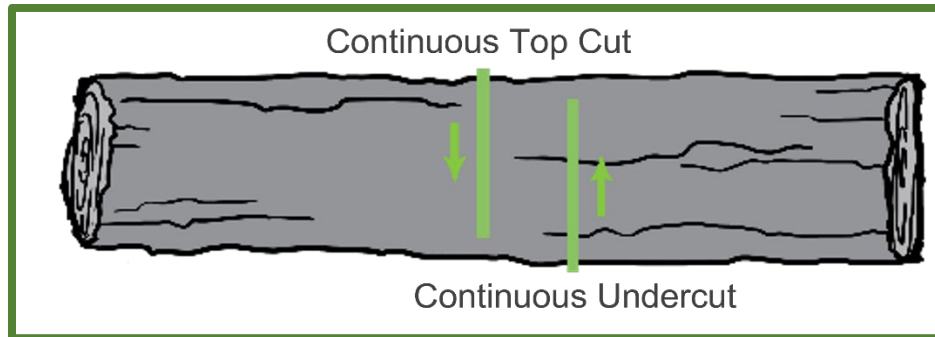


Figure 3.2.10—Straight cut.

### Compound Cut

A **compound cut** consists of two angled cuts that facilitate log rollout. The severed log is widest towards the direction of intended log removal. Sawyers typically use this cut when clearing a large log that is across a trail or fireline. The Sawyer or Saw Team must make two compound cuts, and the severed chunk of the log will then roll to its desired objective (figure 3.2.11).

This reduces the chance that the log will bind when you roll it out of the way.

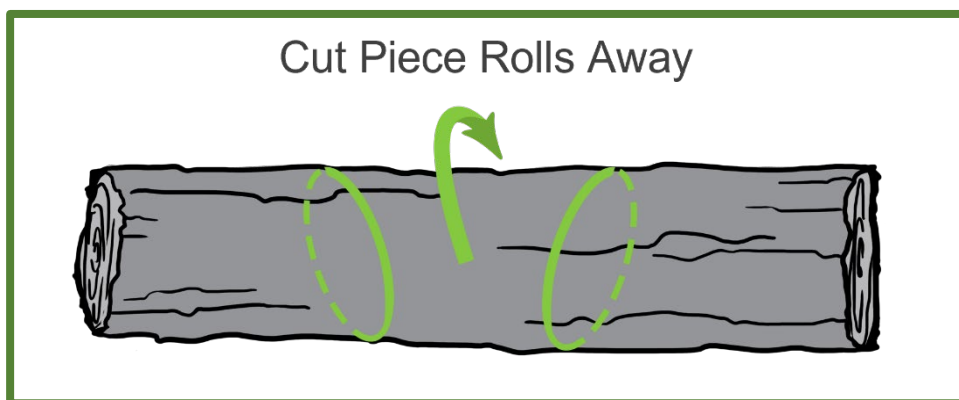


Figure 3.2.11—Compound cut.

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### Offset Cut

An **offset cut** is when a sawyer places a top cut and a bottom cut so that the two cuts do not match up exactly (figure 3.2.12). You would use this kind of bucking operation when a log has top bind and only one side will fall to the ground.

Once you have made the top cut on the compression side to a depth where the saw starts to pinch, select an underbucking location about half an inch to the side of the top cut and on the side of the log that will not drop to the ground.

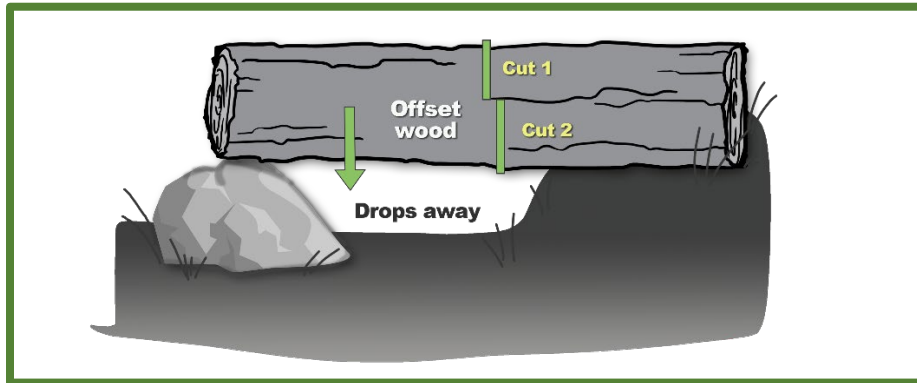


Figure 3.2.12— Offset cut.

### Chopped Cut

A **chopped cut** is made with an ax (figure 3.2.13). With practice, you can chop through most smaller trees with an ax in about the same time as you can cut through them with a crosscut saw. You may use a chopped cut when binds prohibit sawing or when encountering any circumstances where employing the length and size of a crosscut saw may be impractical due to terrain, space, or brush, etc.

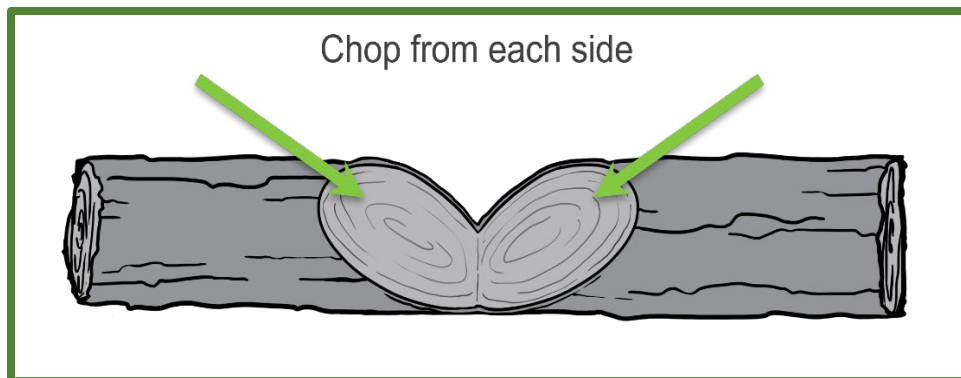


Figure 3.2.13— Chopped cut.

### Saw Protection

Often as you sever the last bit of wood on a top-down cut, the saw naturally drops a few inches. If there is anything below the saw, it could damage the saw. Be sure to remove rocks and dirt

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under the log that could dull the saw. Try to dig under the log and place bark or other soft material there to protect the saw when you finish the cut. Remove all vegetation from the path of the saw.

When a log rests on or is close to the ground, you may choose to finish cutting the tree with a single-buck operation or even use a handsaw to keep the crosscut saw in good working order. Single bucking with just the tip of a saw allows you to use shorter strokes where the saw only contacts the wood rather than using longer strokes and inevitably sawing some soil into the cut.

### Other Considerations

#### *Bark Removal*

Bark on logs can contain sand, dirt, and small rocks (from dust storms, erosion, and landslides) that can dull the saw. This is most common in logs with thick and furrowed bark. Fire-charred logs also dull saws. In these situations, most crosscut sawyers remove the bark with an ax before they start cutting. In addition, bark is spongy and can reduce the effectiveness of wedges. Remove bark when it has the potential to dull the saw or negatively affect wedging.

You can reuse the removed bark. On trees that are hovering close to the ground, use peeled bark to help buffer the ground where a saw could possibly drop after you complete the cut. This will protect the teeth of the saw.

#### *Tool Placement*

The saw team should talk through wedge and ax placement so you can easily and safely access them during the cutting process. Do not place tools on top of logs where they may fall on a sawyer.

#### *Establishing a Work Platform*

Because crosscut sawing requires good balance, you need a level platform under your feet. Remove logs, branches, brush, and other vegetation. If necessary, use a digging tool to create footholds on steep ground.

#### *Wedging*

Wedge placement in bucking is not a thoughtless process of just trying to keep the kerf open. When dealing with a severe top bind, placing two or more wedges parallel to each other on the top of the kerf will afford you the most opening power. As you pound one wedge in, the other wedge or wedges become loose in the kerf. Then, you can pound the other wedges deeper, slowly opening the kerf. This method allows you to top-down buck logs.

We will discuss wedging in more detail in Module 6: Wedges.

#### *Pinched Saw*

All sawyers will inevitably pinch a saw and be unable to remove it from the kerf. If this happens, consider:

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- Wedging more aggressively
- Using a small tree as a lever to lift the log so you can open the kerf and remove the saw
- Using a different saw or ax to buck the tree in a different location to alleviate the bind
- Using wedges if a log is on or near the ground to lift the log enough to free the saw

We will discuss wedging in more detail in Module 6: Wedges.

### Underbucking

One more thing to consider is underbucking.

Underbucking is sawing from the bottom of a log upward toward the top. You can do it:

- By hand
- Using a mechanical underbucker
- With an ax handle to support the saw

Because of the added physical difficulty of underbucking with a crosscut saw, most crosscut sawyers agree that it is best to avoid underbucking. Ways to avoid underbucking with a crosscut saw are:

- Buck the log with an ax.
- Underbuck with a handsaw.
- Cut top down with a crosscut saw and wedge aggressively.
- Use a lever to lift the underside of the log, thus alleviating top bind.

Even with all these options, there are still times that underbucking with a crosscut saw will be the most efficient method to clear the trail.

You will learn more about how to plan and complete underbucking when you practice in the field later in training.

Some sawyers underbuck freehand, while others prefer to use an underbucking tool (underbucker, figure 3.2.14) or an ax to assist with the process. If using an ax or underbucker, first determine which side of the severed log would remain the most stationary and use that side as the anchor point for the underbuck. If the log moves, it could damage the mechanical underbucker or the ax.

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**Figure 3.2.14—Underbucking tool.**

When using an ax to support the underbucking saw, plant the ax in the log and use the handle as a support for the back of the saw. Strike the ax so the handle remains at about a 30-degree angle to the tree. This is the optimal angle to support the saw and still give you working space. Place the back of the inverted saw in the underbuck groove.

The saw typically starts at an angle of about 45 degrees from horizontal. With your guiding hand holding the back of the saw, apply light, downward pressure on the underbucker or ax handle and push the saw forward. Pressure on the underbucker must be consistent on the push and pull strokes. Oil in the underbuck groove of the ax handle will help the saw run easily and will reduce wear on the ax handle.

You can use a single-bit ax to pound a mechanical underbucker into the log.

### **Video: Crosscut Saw Bucking**

Next, you will watch a video that provides an excellent visual of this module and will tie everything together that you just learned. Then you will discuss your questions with the instructor and other students.

### **Knowledge Check**

Take a few moments to answer the questions below, then discuss them with the class.

What good communication points should a saw team discuss prior to beginning a bucking cut?

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What are three considerations for safe bucking?

What are three considerations for safe limbing?

## Summary

In this module, you learned to:

- Explain the importance of saw team communication.
- Understand OHLEC for limbing and bucking.
- Identify proper limbing techniques.
- Identify the different types of binds.
- Describe a bucking plan and techniques.

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