USDA Forest Service
National Sawyer Training:
Developing Thinking Sawyers

Student Guide: Classroom

This page intentionally left blank.

Table of Contents

List of Figures

This page intentionally left blank.

Module 2.2: Chain Saw Brushing, Limbing, and Bucking

Introduction

This module presents techniques for brushing, limbing, and bucking using a chain saw. The instructor will present these concepts in the classroom and will follow them up with demonstrations. You will then practice these techniques in the field under controlled and supervised conditions.

Module Topics

- Brushing
- OHLEC
- Spring poles
- Limbing
- OHLEC
- Limbing techniques
- Bucking
- OHLEC
- Binds
- Bucking techniques

Objectives

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

- Describe brushing plans and techniques.
- Describe methods for removing a spring pole.
- Describe limbing plans and techniques.
- Describe bucking plans and techniques.

Prework Review

The Sawyer/Swamper Team

Each year, some swampers receive lacerations to the hands, arms, or legs by working too close to a running chain saw. Chain saw cuts are not simple cuts like those caused by a knife, they are horrible wounds that shred flesh and can quickly remove muscles, tendons, and bone. The sawyer and the swamper have a shared responsibility for maintaining each other's safety and cutting area control.

The sawyer may need to operate the chain saw near the swamper. This will present unique safety considerations. The sawyer and swamper must be aware of the cutting area. The cutting area is the zone where the sawyer can cut the swamper with a saw, represented by a 360-

degree radius around a sawyer at a distance equivalent to the sawyer's arm length plus the length of the tool.

What is a Swamper?

Brushing, limbing, and bucking can generate large quantities of cut material that must be moved. One or more people work with a sawyer to help remove (dragging, throwing, etc.) the material. These people are commonly referred to as "swampers." Sawyers and swampers working together are referred to as a "saw team."

Safety

Ways for mitigating safety concerns include:

- Communication
- Awareness
- Personal protective equipment (PPE)

Role of the Sawyer

- Discuss the operation with the swamper.
- Maintain awareness of the location and proximity of the swamper(s).
- Communicate when it is clear for the swamper to remove the cut material.
- Cut material to a size that facilitates removal.
- Ensure cutting area control.

Role of the Swamper

- Discuss the operation with the sawyer.
- Always follow the direction of the sawyer.
- Remain in clear view of the sawyer.
- Do not approach unless the sawyer indicates that you can.
- Never push or pull material while the sawyer is cutting it.
- Always stay out of the sawyer's strike zone.
- Wait for the "all clear."
- Help to identify hazards, maintain awareness, and assist with cutting area control.
- Remove cut material.

Review Questions

What is the role of a swamper?

What is the role of a sawyer?

Brushing

So, what is brushing?

Multiple small-diameter stems, such as shrubs or regeneration (material smaller than 5 inches in diameter), typically grow close together or in clusters. Severing these small-diameter stems using a chain saw is known as "brushing."

OHLEC: Brushing

When you apply OHLEC (objectives, hazards, leans/binds, escape plan, and cut plan) to brushing, some things to consider include:

- **Objective**: Where do you want the stem(s) to go?
- **Hazards**: Proximity of swampers? What hazards exist?
- **Leans/binds**: In which direction do the stems lean? Where are the binds? Where is tension/compression?
- **Escape plan**: Are you and the swamper positioned in a safe location with good footing? Is your escape path clear?
- **Cut plan**: What type, location, and sequence of cuts will you use?

Mitigating Brushing Risk

While brushing, the chain saw will cut through brush and small stems rapidly and the potential for kickback is high.

Some ways to mitigate the risk include:

- Focus on cutting one stem at a time when possible.
- Maintain correct chain tension, chain sharpness, and correct depth gauge clearance so the chain saw operates as smoothly as possible.
- Position yourself so that you are not in-line with the kickback arc.
- Maintain secure footing, proper body position, and saw handling.

Brushing Techniques

Having a brushing plan helps to increase control of the cutting area, safety, and efficiency, and also helps you to determine where the cut material will go. Techniques you can use fall into two categories: general and directional.

General Brushing Techniques

- Cut one stem at a time. The chain is more likely to be thrown when you cut multiple small-diameter stems.
- Engage the chain brake when moving with the chain saw or swamping material.
- Maintain proper chain tension.

- Maintain a high chain speed when initiating cuts.
- When nearing the end of the cut consider reducing chain speed to avoid contacting dirt.
- Avoid twisting the bar.
- Work systematically, considering stem density and topography.
- Cut materials to a manageable size for swamping.
- Periodically remove (swamp out) cut debris from the cutting area to avoid tripping and kickback hazards.
- Make the final cuts as close to the ground as possible and parallel (flush) to the ground to minimize pointed stobs and tripping hazards.

Directional–Tab Cut

For material smaller than 5 inches in diameter, make one horizontal cut from the back toward the desired direction of fall (figure 2.2.1). This leaves a small section of uncut fiber known as the "tab." This tab maintains the connection between the log and stump and helps to guide the material in the intended direction. You can sever this tab later when brush disposal becomes necessary.

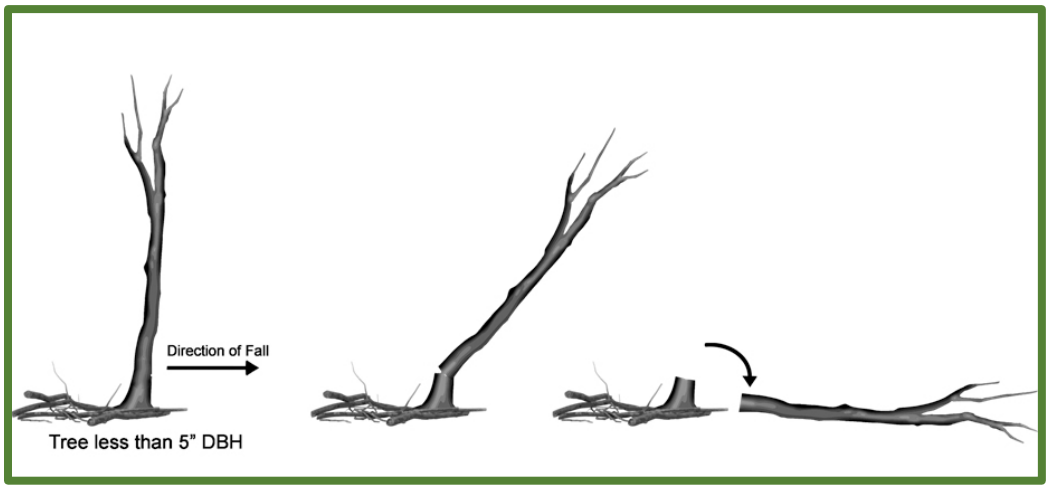

Figure 2.2.1—A tab cut.

Spring Poles

Spring poles are trees or limbs that are bent over and under pressure (figure 2.2.2). Cutting them in the wrong location can cause a sudden release of energy that could severely injure you.

When feasible, the safest way to handle spring poles is to avoid them. If you must release one, try to release it slowly, as shown in the video "OHLEC for Spring Pole Mitigation."

Video: Spring Poles

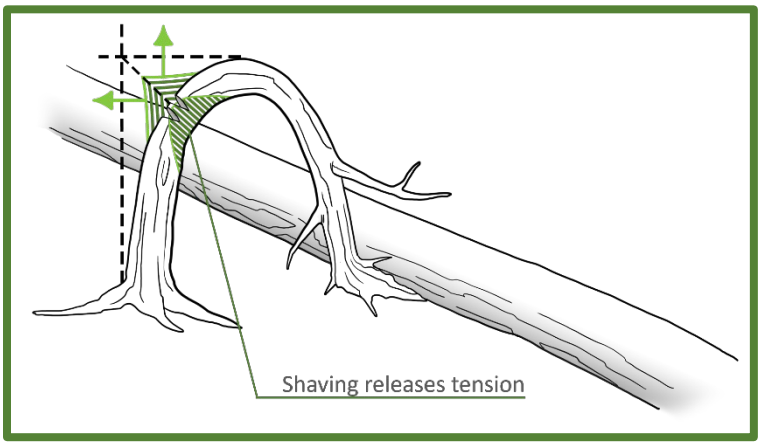

Figure 2.2.2—A spring pole.

After watching the video, discuss any questions you may have.

Limbing

Limbing is severing limbs from the main stem (bole) of a tree. You may use limbing when the tree is standing vertically or lying on the ground. The tree may be anchored and secure or may be unanchored and susceptible to movement. Removing limbs from a tree that is unanchored may cause the tree to roll or move.

OHLEC: Limbing

The first step in any operation is always OHLEC.

Limbing involves asking the following questions:

- **Objective**: Where do I want the limb to go?
- **Hazards:** What hazards exist? Are they overhead or ground hazards? Is the tree anchored in place?
- **Leans/binds:** In which direction does the limb lean and where is the compression/tension on the limb?
- **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? **Note:** Your escape plan should account for the movement of the bole of the tree and limbs that may be under tension. Escape paths can and will change as you cut more limbs.
- **Cut plan:** What type, location, and sequence of cuts will you use?

Mitigating Limbing Risk

To mitigate risk while limbing:

- Maintain secure footing, proper body position, and saw handling.

- Carefully review overhead and ground hazards that may be hidden from view by branches and debris.
- Determine limb tension and compression areas.
- Determine whether removing a limb will affect tree stability.
- Understand that new areas of tension and compression may develop if the stability of the tree changes.
- Continue to size-up the log after you remove each limb.
- When nearing the end of the cut consider reducing chain speed to avoid contacting dirt.

Limbing Techniques

Sawyers use several techniques for limbing. The techniques we will discuss today are the straight cut, tab cut–limbing (figure 2.2.3), drop cut, hinge cut, and bypass cut.

Straight Cut

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

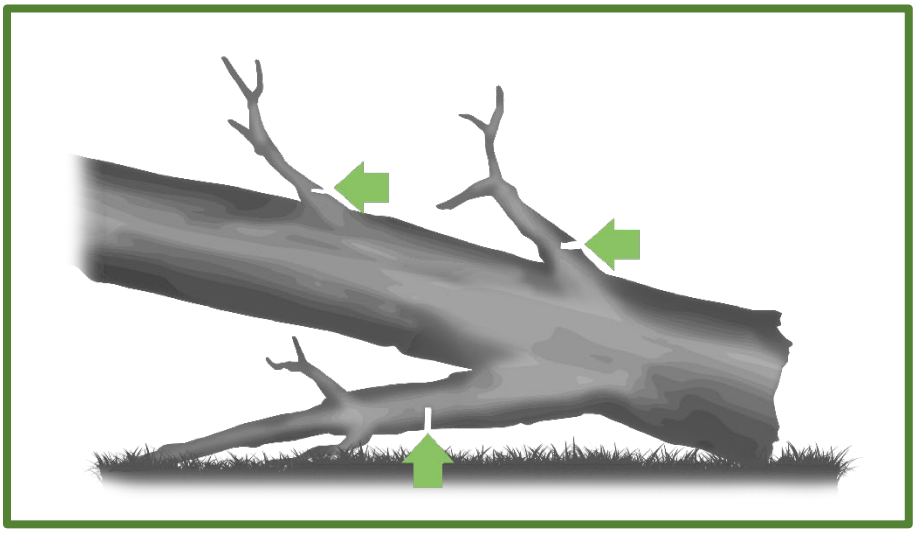

Figure 2.2.3—A tab cut used for limbing.

Tab Cut—Limbing

When executing a tab cut for limbing, make one cut from the back toward the desired direction of fall. This leaves a small section of uncut fiber (known as the “tab”). The tab maintains connectivity between the limb and the log and helps to guide the material in the intended direction. You can sever this tab as the limb commits to the lay or after it comes to rest.

Drop Cut

Sawyers use the drop cut for pruning and limbing (figure 2.2.4). When trimming heavy or large limbs and branches on trees you intend to leave standing, you should use the drop cut technique. Be extra careful not to damage the branch bark ridge or the branch collar, which will interfere with the tree's natural healing response.

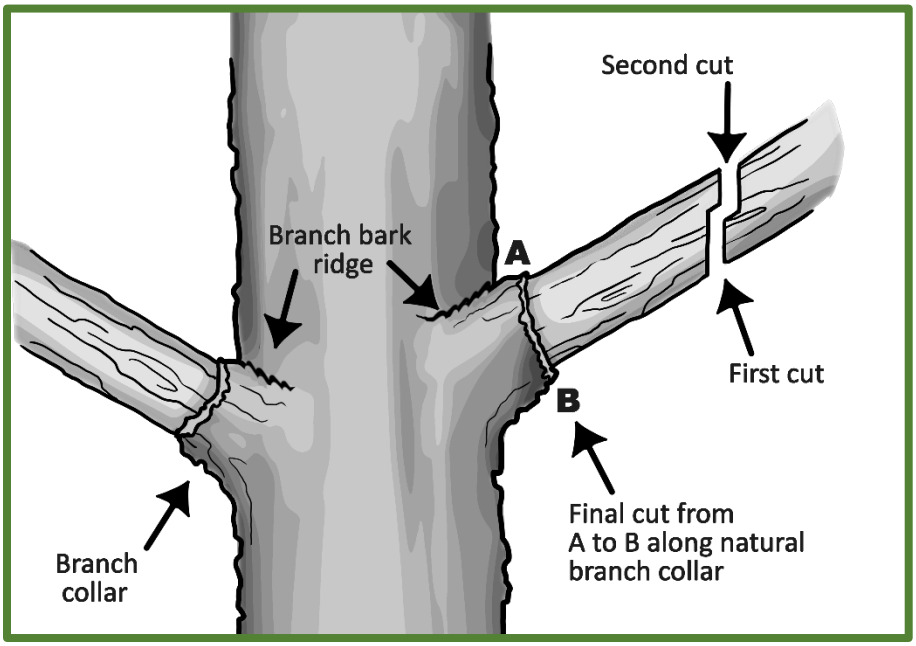

Figure 2.2.4—A drop cut.

Properly pruning large tree limbs or branches involves three cuts:

- **First cut:** Cut a kerf from the bottom of the limb about a quarter of the way through the limb. This kerf will keep the wood from splitting, bark from tearing, or the limb from hanging on too long after you make the next cut.
- **Second cut:** On the top of the limb (farther from the bole than the first cut), cut through the limb. This removes the weight of the limb, prevents damage to the tree bole, and allows the branch to drop straight down, providing some control over how a branch or limb will react when it makes contact with other surfaces.
- **The final cut**: On trees you intend to leave standing, the final cut is the one that really matters! You make the final cut outside the branch bark ridge and the branch collar, where the branch collar transitions to smooth branch bark. Follow the slant of the branch collar. If you can't fit your saw into the crotch at the right angle, cut it from the bottom up.

Hinge

Create a notch and use a backcut to construct a hinge and directionally fall larger diameter limbs (figure 2.2.5).

Cuts 1 and 2: Using the top of your bar at about a 45-degree angle, create a notch on the side of the limb that is under compression.

Cut 3: Using the bottom of your bar, cut from the back of the limb (tension side) toward the notch, leaving a section of uncut fiber that acts as a hinge. Continue severing fiber until the notch begins to close and the limb falls.

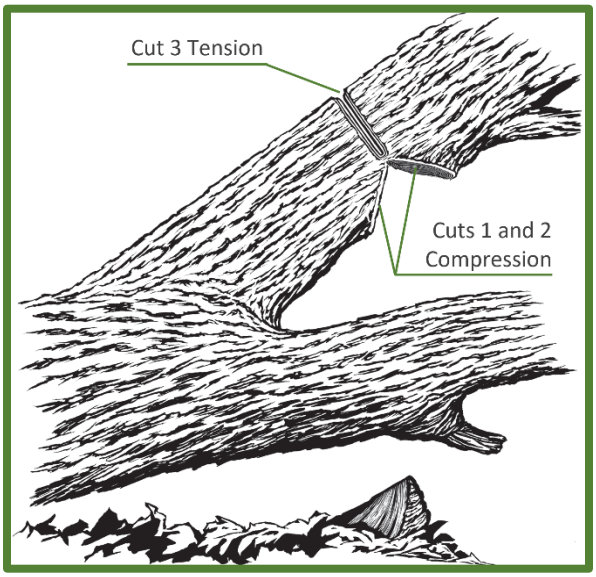

Figure 2.2.5—A hinge.

Bypass Cut

The bypass technique is a series of cuts a sawyer makes on limbs that bypass each other from opposite directions to maintain connectivity between the cut section and the bole (figure 2.2.6). You can use this technique to avoid the need for you or a swamper to bend over to retrieve each limb as you cut it.

Sequence: Make the first cut part way through the limb on the side with compression. Make a second cut part way through the limb that bypasses the first cut on the tension side slightly offset from the first cut (above or below).

Location: Make the cuts parallel to the bole and ensure they bypass each other, leaving uncut fiber between the two that will maintain connectivity between the limb and the bole.

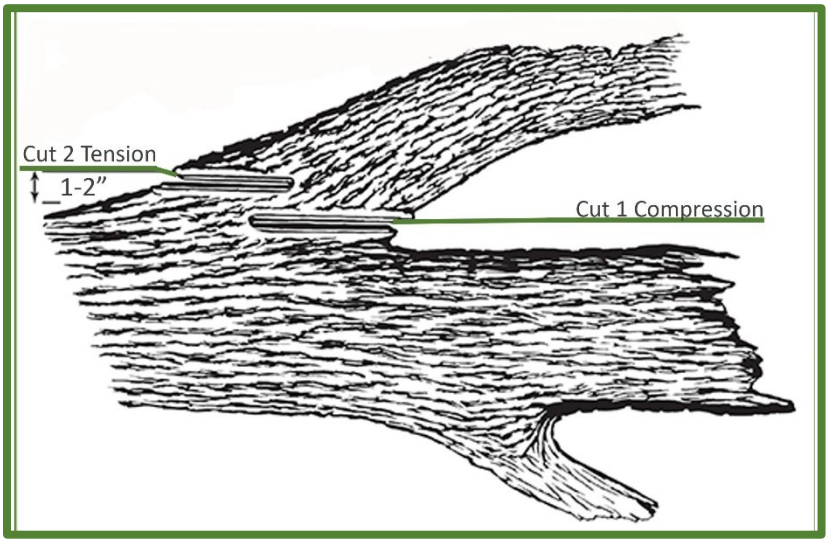

Figure 2.2.6—A bypass cut.

Bucking

Bucking is sawing longer logs or limbs into shorter lengths. The length of the cut pieces depends on the task at hand. Consider the effort required to move the cut sections when deciding how big to buck the pieces.

OHLEC: Bucking

The hazards associated with bucking are often overshadowed by those present during felling operations. Bucking typically involves sawing wood that is not anchored to the stump. It is important to consider the stability of the log you need to buck.

Bucking involves asking the following questions:

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

Video: Brushing, Limbing, and Bucking

Watch the video “OHLEC Chain Saw Limbing and Bucking.” After the video, discuss any questions you may have.

Mitigating Bucking Risks

Some important tips for mitigating risks during bucking operations include:

- Evaluate the entire length of the log to determine contact/pivot points.

- Work on the uphill (good) side of logs whenever possible.
- Identify tension/compression and know where to stand when you finish the cut.
- Determine the initial stability of the log.
- Understand that as you cut sections, new areas of tension and compression may develop.
- Consider the need for securing the bucked section to prevent movement or rollout (steep slopes).
- Maintain secure footing, proper body position, and saw handling.
- Be mindful when bucking **blowdown** of attached root wads and extreme tension. If available, consider using heavy equipment to help move severed logs.
- Remember that logs with attached root wads may **stand up** during or after bucking.
- When nearing the end of the cut consider reducing chain speed to avoid contacting dirt.

Binds

It is not a question of if, but when and where, your saw will get stuck during 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.

The **tension area** is the portion of the log where the wood fibers stretch apart. The chain saw kerf in this portion of the log opens as you make the cut. The **compression area** is the portion of the log where the wood fibers push together. The kerf in this portion of the log closes as you make the cut.

It is critical to identify binds before creating a cut plan because the types of binds determine the bucking techniques and procedures you will use.

Types of Binds

There are four types of binds: top, bottom, side, and end. Logs normally have a combination of two or more binds.

In a **top bind,** the tension is on the bottom of the log and the compression/bind is on the top (figure 2.2.7).

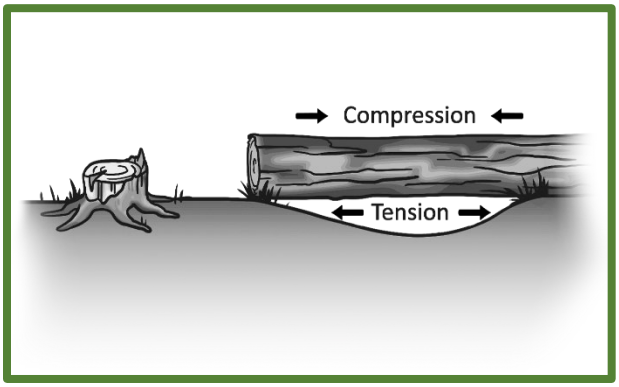

Figure 2.2.7—A top bind.

In a **bottom bind,** the tension is on the top of the log and compression is on the bottom (figure 2.2.8).

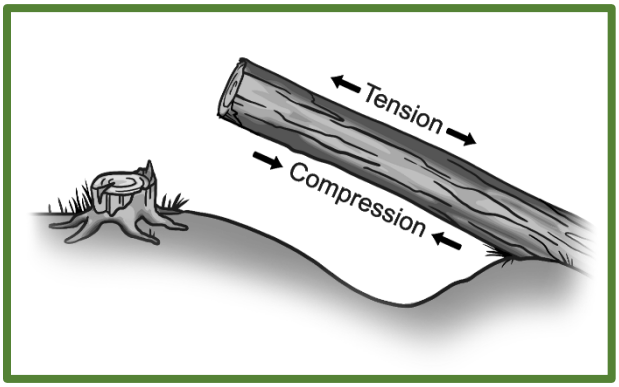

Figure 2.2.8—A bottom bind.

In a **side bind**, tension is exerted sideways on the log (figure 2.2.9). This is often a dangerous situation. The severed side-bound log has tremendous potential to move fast with great force toward the tension side of the log. It is very important to cut side-bound logs from the safe (good) side of the log.

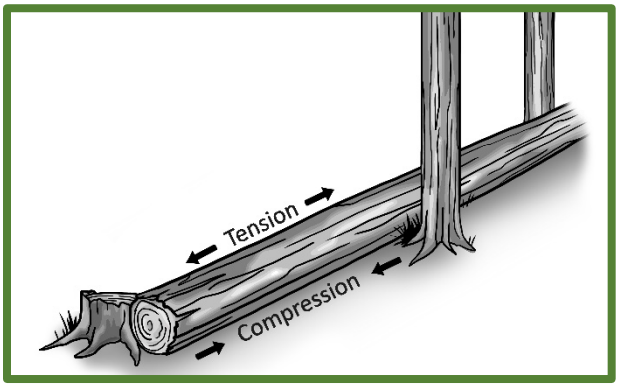

Figure 2.2.9—A side bind.

In an **end bind**, weight compresses the entire cross section of the log (figure 2.2.10). There is potential here for the kerf to close with any cut that you select. Wedges are imperative. Always be aware that the high side of the log could move or roll when cut. 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.

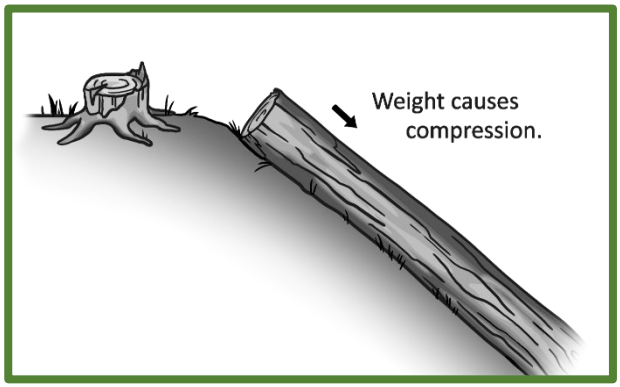

Figure 2.2.10—An end bind.

Pivot Points

Pivot points are ground features (such as stumps, rocks, and logs) that may cause a bucked log to react unexpectedly (figure 2.2.11). Sawyers most often encounter pivot points while bucking. Pivot points can be dangerous if you do not recognize them beforehand.

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

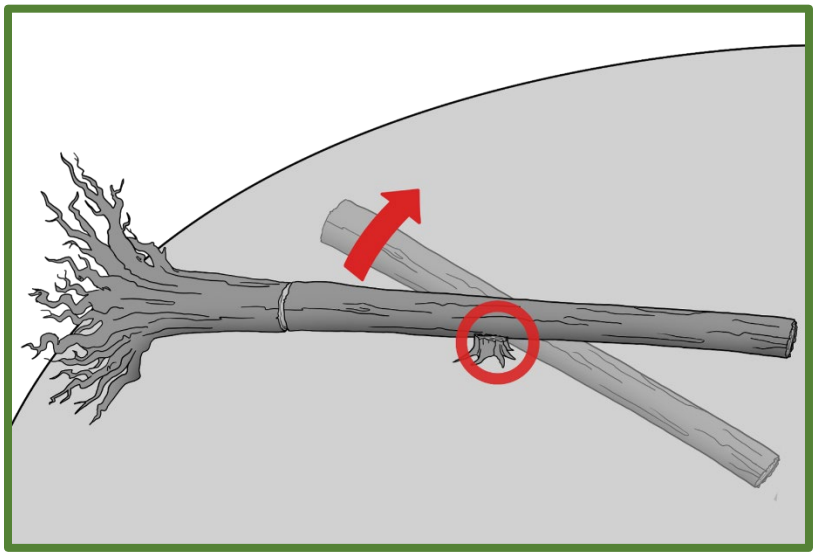

Figure 2.2.11—Pivot points.

Bucking Techniques

The three basic types of cuts used in bucking are:

- A **straight cut**—made through the log starting at the top or bottom. This is generally the most efficient bucking cut. You will often only be able to make a straight cut through the log with the help of wedges.
- A **compound cut**—consists of two angles that facilitate log rollout. The severed log is widest toward the direction you intend to remove the log. Sawyers typically use this cut when clearing a large log that lies across a trail or fireline. This cut reduces the chance that the log will bind when you roll it out of the way.
- An **offset cut**—consists of a top and bottom cut placed so the two cuts do not match up exactly. Sawyers use this kind of bucking technique to time the release of the cut section. Once you make the bottom cut deep enough that the saw starts to pinch, select a top cut location offset about a half inch from the bottom cut

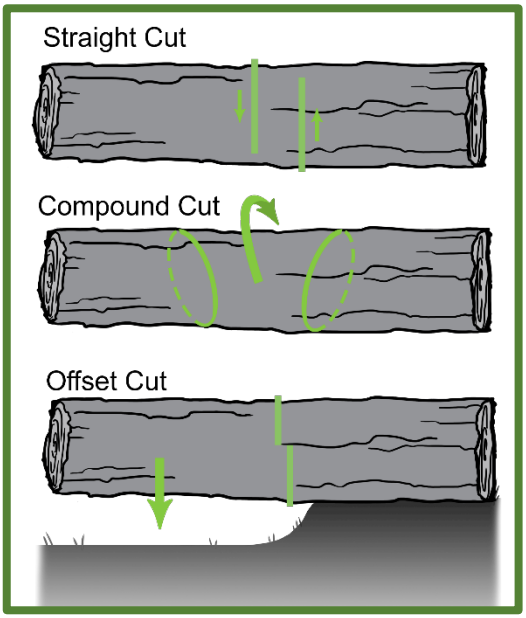

Figure 2.2.12—Bucking techniques.

Bottom Bind: Slabbing Out

You may intuitively choose to cut a log with bottom bind by using a straight cut starting at the top and simply cutting downward as the kerf opens. However, if you don't make a relief cut on the compression side of the log first, the bucked log will drop, often resulting in a horizontal split near the bottom and creating a slab that connects the two bucked sections. Slabbing out can prevent you from rolling a log free and can cause the saw to become pinched or pulled, requiring you to cut at or near the ground, which often results in a dull saw chain. Slabs also present an additional hazard to others involved in a saw operation if a bucked section of log breaks free and begins to roll. Slabs can catch clothing and knock you off balance, and can also cause lacerations or puncture wounds.

When severing a log with bottom bind, you should use two cuts in tandem. Make the first cut from the bottom of the log on the compression side by severing only a minimal amount of wood fiber 1 to 3 inches deep, depending on conditions. Make the second cut (which aligns with the first cut) from the top down to allow the bucked log to break free cleanly and/or for you to roll it away.

Executing the Cut

Before executing the cut, you must:

- **Determine bucking locations—**Determine if the log is supported. Look for broken limbs and tops above the working area. Avoid standing beneath an overhead hazard while bucking.
- **Determine the offside—**The side to which the log might move when you cut it is called the "offside" or "bad side." It is normally on the downhill side of the log.
- **Cut the offside first from a safe position:** If possible, make a cut about one-third the diameter of the log. This allows you to step back from the log on the final cut.
- **Watch the kerf to detect log movement—**Position yourself so you can detect a slight opening or closing of the kerf; there is no better indicator of the log's reaction on the release cut. If you cannot evaluate the bind, proceed with caution. Cut only far enough to place a wedge. Continue cutting. Watch the kerf. If the kerf begins to open, the log has a bottom bind. If the kerf begins to close, the log has a top bind.
- **Hazards of bucking in blowdown—**Strong winds uproot trees in blowdown areas. At any time while you are making bucking cuts, the root wad can drop back into place or roll in any direction. Avoid standing directly behind or downhill from the root wad. Logs can be under extreme pressure and can potentially break quickly, even before you have completely cut them. Most blowdown situations are highly hazardous and can present complex cutting situations. Be sure your knowledge and skill level are commensurate with the situation. Equipment or explosives may be a safer alternative.
- **Escape plans for bucking—**Your escape plans for bucking should account for the release of energy from the tension side and the reaction of the two severed pieces. Sometimes all that you need is to simply step back.

Top Bind Compression

The sequence for cutting top bind compression is (figure 2.2.13):

1. Standing on the uphill side of the log, start by making a cut from the top down about one quarter of the log diameter (figure 2.2.14).
2. Line up the bar on the bottom of the log with the top cut and make the second cut from the bottom up to the top cut (figure 2.2.15).
3. Move to your escape path when the cuts meet and the log begins to drop.

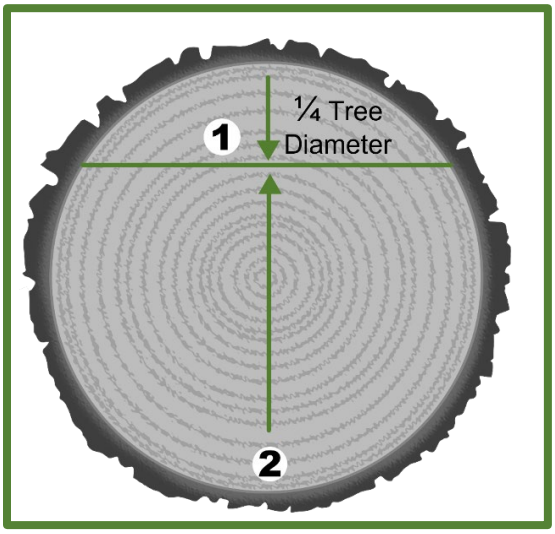

Figure 2.2.13—Sequence for cutting top bind compression.

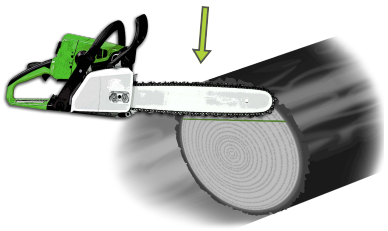

Figure 2.2.14—Top bind cut, step 1.

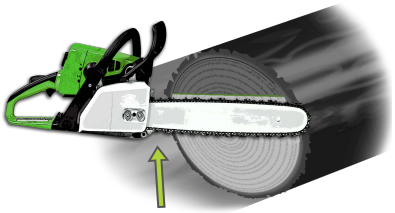

Figure 2.2.15—Top bind cut, step 2.

Bottom Bind Compression

The sequence for cutting bottom bind compression is (figure 2.2.16):

1. Standing on the uphill side of the log, start by making a cut from the bottom up about one quarter of the log diameter.
2. Line up the bar on the top of the log with the bottom cut and make the second cut from the top down to the bottom cut.
3. Move to your escape path when the cuts meet and the log begins to drop.

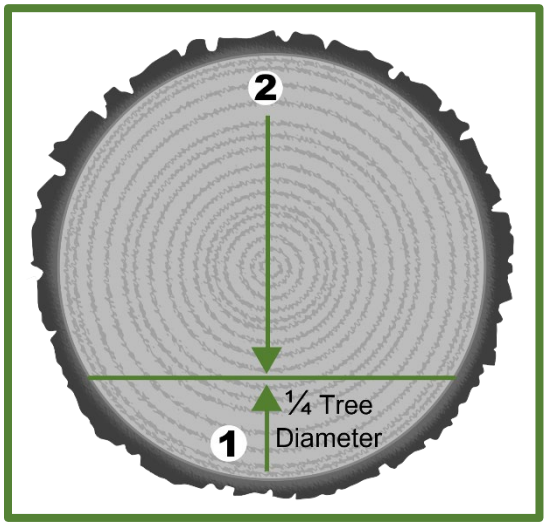

Figure 2.2.16—Sequence for cutting bottom bind compression.

Top Bind Compression (Greater Than Bar Length)

The sequence for cutting top bind compression on a small log that is wider than the chain saw bar is (figure 2.2.17):

1. Standing on the uphill side, reach over and cut the low or **offside** to about one quarter of the log diameter.
2. Line up the bar up with the first cut and cut down from the top about one quarter of the log diameter.
3. Underbuck from below upward to finish the bucking cut.
4. Move to your escape path as the cuts meet and the log begins to drop.

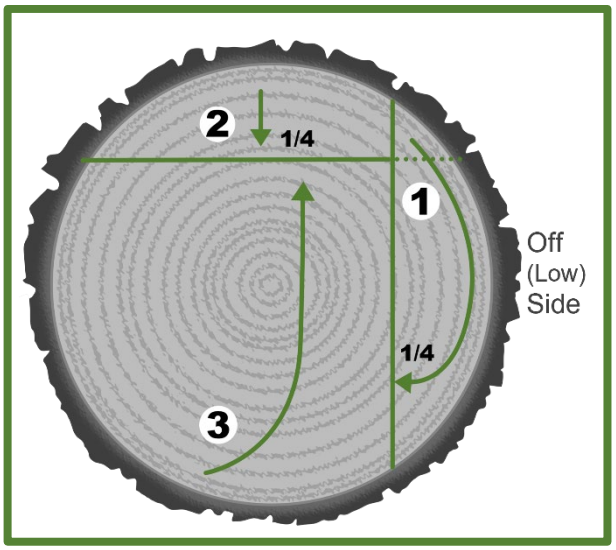

Figure 2.2.17—Sequence for cutting top bind compression on a small log.

Bottom Bind Compression (Greater Than Bar Length)

The sequence for cutting bottom bind compression on a small log that is greater than bar length (figure 2.2.18):

1. Standing on the uphill side, reach over and cut the offside about one quarter of the log diameter.
2. Line the bar up with the first cut and cut upward from the bottom one quarter of the log diameter.
3. Cut from the top down to finish the bucking cut.
4. Move to your escape path as the cuts meet and the log begins to drop.

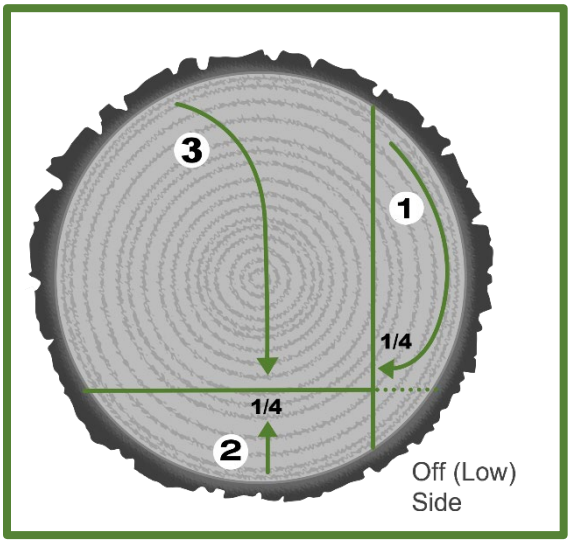

Figure 2.2.18—Sequence for cutting bottom bind compression on a small log.

Bottom Bind (Large-diameter Log)

The sequence for cutting a bottom bind on a large-diameter log is (figure 2.2.19):

1. Standing on the uphill side of the log, reach over and cut the offside one quarter of the log diameter.
2. On the top of the log, line up the bar with the first cut and scribe a shallow cut from the top down and along the high side to three quarters of the log diameter.
3. Underbuck the bottom quarter of the log diameter
4. From the top, line the bar up with the previous cuts and cut the remaining wood down to the bottom cut.
5. Move to your escape route as the kerf opens and the log drops.

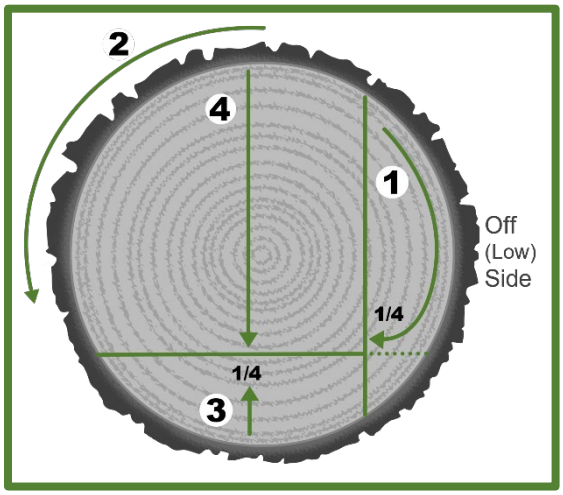

Figure 2.2.1919—Sequence for cutting a bottom bind on a large-diameter log.

End Bind

The sequence for cutting an end bind is (figure 2.2.20):

1. From the top side of the log, cut as much of the offside as you can safely reach.
2. Leave the saw in the kerf and continue cutting around enough to insert a wedge.
3. Cut the remaining wood downward to finish the cut.

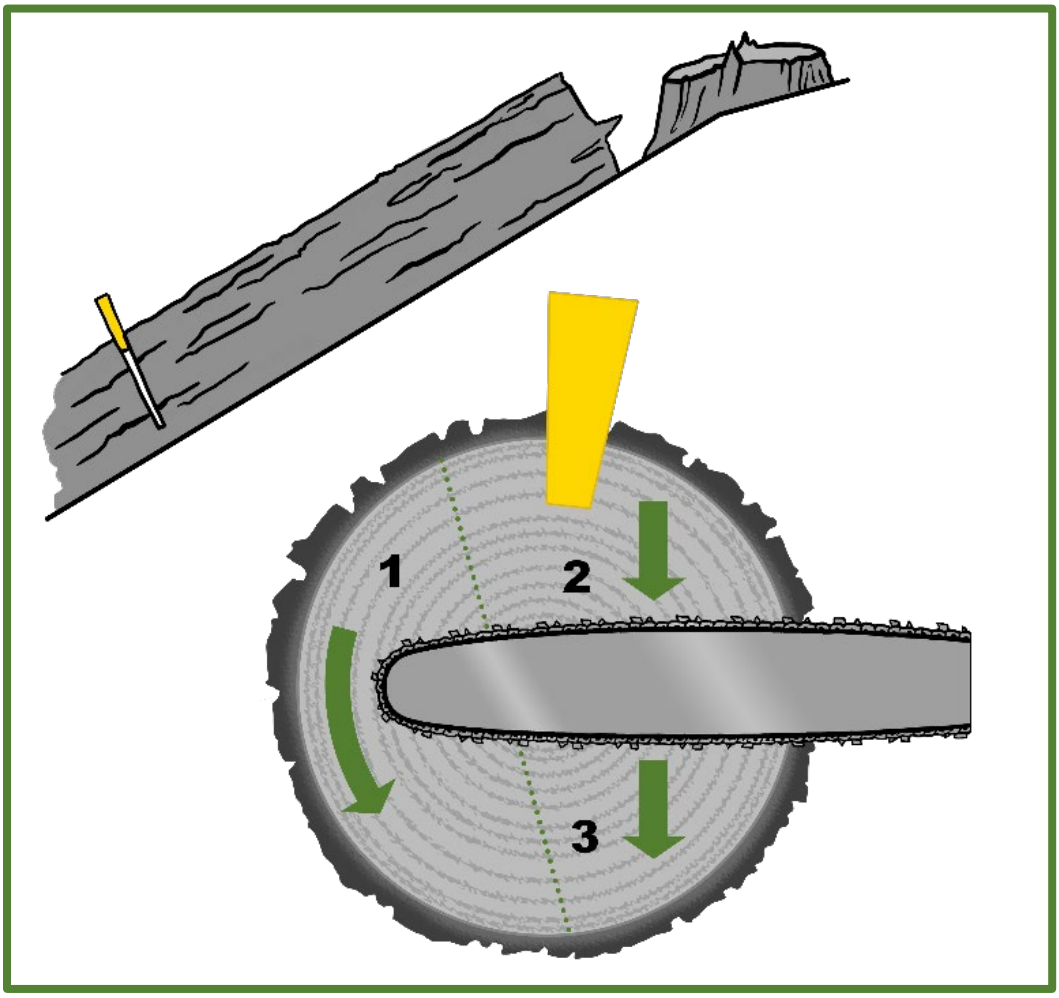

Figure 2.2.20—Sequence for cutting an end bind.

Bucking Companion Tools

Some optional tools used to facilitate moving bucked sections of logs include:

- **Peavey:** used to roll or stabilize logs (figure 2.2.21).
- **Chocks or blocks**: pieces of wood or other material used to stabilize logs.
- **Skids**: small logs used to direct bucked logs into specific placement.
- **Tongs:** used to move or carry logs (figure 2.2.22).
- **Log chains/ropes/pulleys/winches:** used to move or pull logs (figures 2.2.23 and 2.2.24).

Figure 2.2.21—A peavey.

Figure 2.2.22—Log tongs.

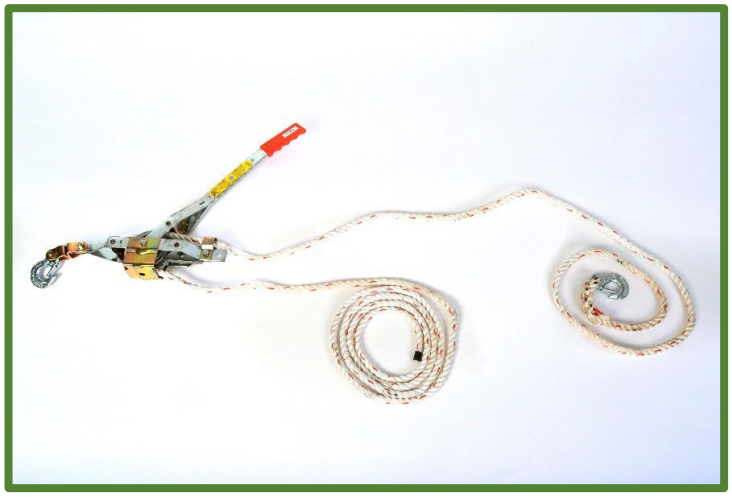

Figure 2.2.23—A rope winch.

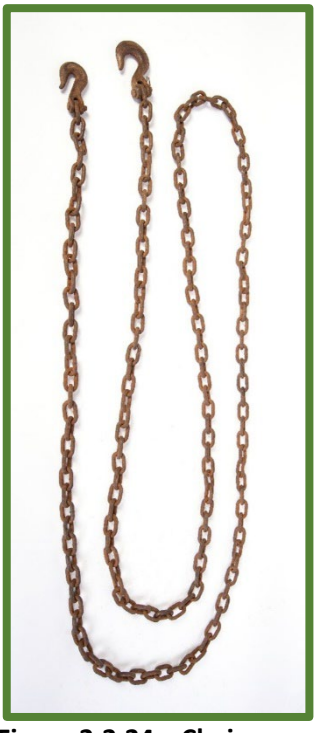

Figure 2.2.24—Chain.

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 2.2.25). 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 mentoring from a more experienced sawyer.

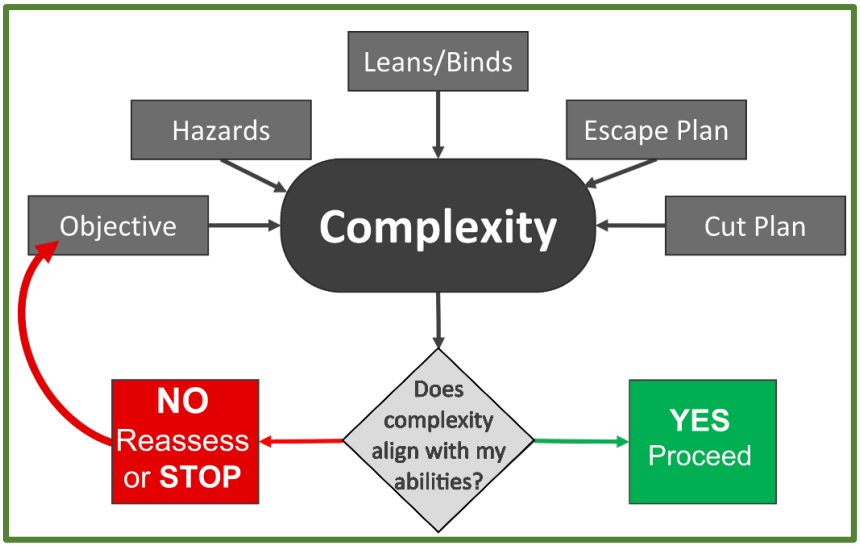

Figure 2.2.25—Complexity flowchart.

Knowledge Check

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

How do you mitigate brushing risks?

What are some questions to ask yourself before you begin limbing?

What is an important consideration before you begin bucking a log?

Where are the tension and compression on a log with top bind?

Summary

In this module you learned to:

- Describe brushing plans and techniques.
- Describe methods for removing a spring pole.
- Describe limbing plans and techniques.
- Describe bucking plans and techniques.

This page intentionally left blank.