USDA Forest Service
National Sawyer Training:
Developing Thinking Sawyers

Instructors Guide

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Table of Contents

Module 2.2: Chain Saw Brushing, Limbing, and Bucking 1
Welcome and Introduction 1
Introduction 1
Module Topics 1
Objectives 1
Prework Review 2
Brushing 3
OHLEC: Brushing 3
Mitigating Brushing Risk 4
Brushing Techniques 4
Spring Poles 5
Video: Spring Poles 6
Limbing 6
OHLEC: Limbing 7
Mitigating Limbing Risk 7
Limbing Techniques 8
Straight Cut 8
Tab Cut—Limbing 8
Drop Cut 9
Hinge 10
Bypass Cut 10
Bucking 11
OHLEC: Bucking 11
Video: OHLEC for Chain Saw Limbing and Bucking 12
Mitigating Bucking Risks 1 12
Mitigating Bucking Risks 2 13
Binds 13
Top Binds 14

Bottom Binds 14
Side Binds 14
End Binds 15
Pivot Points 15
Bucking Techniques 16
Bottom Bind: Slabbing Out 17
Executing the Cut 17
Top Bind Compression (Small Log) 18
Bottom Bind Compression (Small Log) 19
Top Bind Compression (Greater Than Bar Length) Say: 19
Bottom Bind Compression (Greater Than Bar Length) 19
Bottom Bind (Large Diameter Log) 20
End Bind 20
Bucking Companion Tools 1 20
Bucking Companion Tools 2 21
Operational Complexity: Putting it All Together 22
Knowledge Check 23
Summary 23
Questions 24

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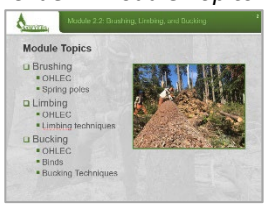
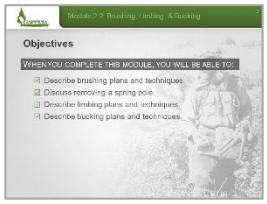
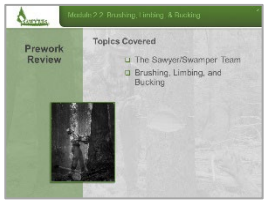
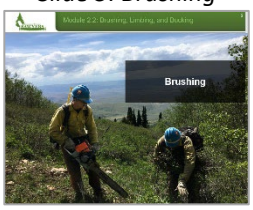
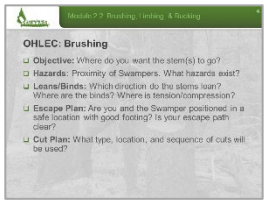
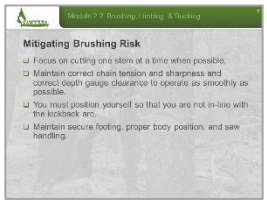
Module 2.2: Chain Saw Brushing, Limbing, and Bucking

This module teaches techniques for brushing, limbing, and bucking with a chain saw.

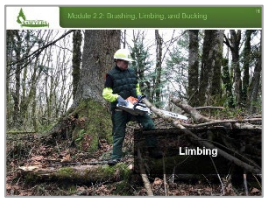
Slide/Action	Content
	## Welcome and Introduction **Time:** 130 Minutes **Note:** You will present techniques in the classroom and provide demonstrations. The students will then practice these techniques in the field under controlled and supervised conditions. Conduct the field portion of this module at a cutting site that has downed and/or standing trees, brush, and small-diameter regeneration. **DISPLAY TITLE SLIDE**
Slide 1: Chain Saw Brushing, Limbing, Bucking 	## Introduction **Say:** This module teaches techniques for brushing, limbing, and bucking using a chain saw. **DISPLAY NEXT SLIDE**
Slide 2: Module Topics 	## Module Topics **Review** Review the module topics listed on the slide. **DISPLAY NEXT SLIDE**
Slide 3: Objectives 	## Objectives **REVIEW** Review objectives with the class. **DISPLAY NEXT SLIDE**

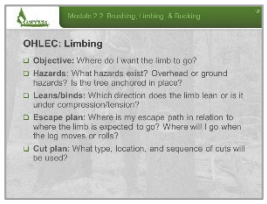
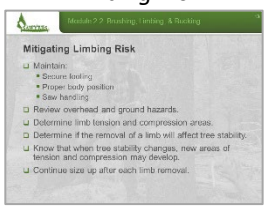
Slide/Action	Content
Slide 4: Prework Review 	## Prework Review **REVIEW** Review the topics covered in the prework packet. ### Say: We will cover some of these topics again during class because they are important for safety or because there are more details you need to know. The rest we will review now. **INSTRUCTOR NOTE:** Allow students a few moments to answer the questions in the student guide, then discuss the answers. Confirm the correct answers and address any misconceptions. ### Review Questions **Q:** What is the role of a swamper? **A:** Answers should include: ▪ Discuss the operation with the sawyer. ▪ Help to identify hazards, maintain awareness, and assist with cutting area control. ▪ Always follow the direction of the sawyer. ▪ Stay in clear view of the sawyer. ▪ Don't approach unless the sawyer gives you the "all clear." ▪ Never push or pull material while the sawyer is cutting it. ▪ Always stay out of the sawyer's strike zone. ▪ Remove cut material. **Q:** What is the role of a sawyer? **A:** Answers should include: ▪ 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 to facilitate removal. ▪ Assure cutting area control. **DISPLAY NEXT SLIDE**

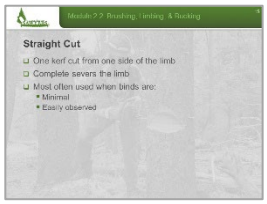
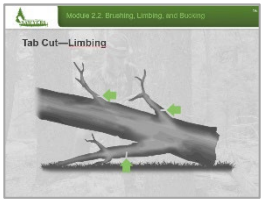
Slide/Action	Content
Slide 5: Brushing 	## Brushing **Say:** So, what is brushing? Plants with multiple small-diameter stems, such as shrubs or regeneration (material smaller than 5 inches in diameter), typically grow close together or in clusters. Severing these small-diameter stems with a chain saw is known as “brushing.” **DISPLAY NEXT SLIDE**
Slide 6: OHLEC: Brushing 	## OHLEC: Brushing **Say:** The first step in any operation is always OHLEC. Remember what each of the letters in the acronym stands for: objective, hazards, leans/binds, escape plan, and cut plan. When applied to brushing, some different questions about OHLEC to consider include: ▪ **Objective:** Where do you want the stem(s) to go? ▪ **Hazards:** Consider the proximity of swampers. What hazards exist? ▪ **Leans/binds:** 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? **DISPLAY NEXT SLIDE**

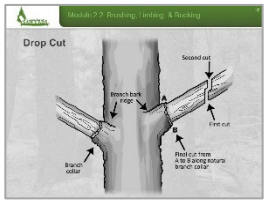
Slide/Action	Content
Slide 7: Mitigating Brushing Risk 	**Mitigating Brushing Risk** **Say:** While brushing, the chain saw will cut through brush and small stems rapidly. The potential for kickback is high. Here are some ways to mitigate the risk: ▪ Focus on cutting one stem at a time when possible. ▪ Maintain correct chain tension, chain sharpness, and 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. **DISPLAY NEXT SLIDE**
Slide 8: Brushing Techniques 	**Brushing Techniques** **Say:** Having a brushing plan helps increase safety, efficiency, and control of the cutting area, and also helps you determine where the cut material will end up. 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 together. ▪ Engage the chain brake when moving with the chain saw or when 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.

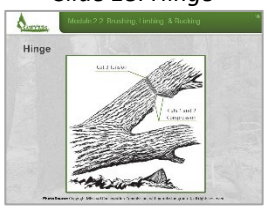
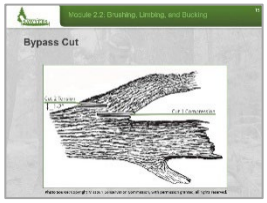
Slide/Action	Content
	▪ Periodically remove (swamp out) cut debris from the cutting area to avoid tripping and kickback hazards. ▪ Make the final cuts as close to the ground as possible and parallel (flush) to the ground to minimize pointed stobs (broken branches or stumps) and tripping hazards. **Directional—Tab Cut** For material smaller than 5 inches in diameter, make one horizontal cut from the back toward the desired direction of fall. This leaves a small section of uncut fiber known as the tab. This tab maintains connectivity between the log and stump and helps to guide the material in the intended direction. You can sever this tab later when you need to dispose of brush. DISPLAY NEXT SLIDE
Slide 9: Spring Poles  	Spring Poles **Say:** Spring poles are trees or limbs that are bent over and under pressure. 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 a spring pole is to avoid it. If you must release one, try to release it slowly, as shown in the following video. DISPLAY NEXT SLIDE

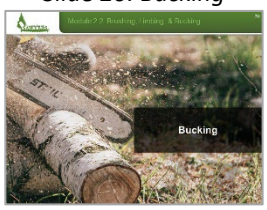
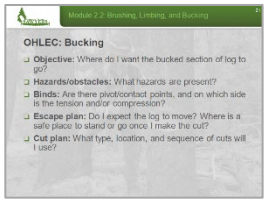
Slide/Action	Content
Slide 10: Spring Poles Video 	## Video: Spring Poles **PLAY VIDEO** ***Video Debrief*** Discuss the following with the class: **Q:** How do you find the point of maximum tension? **Note:** Refer to the spring pole graphic. **Q:** How do you properly execute the cuts? **A:** For a small spring pole, shave compression fiber at or slightly above the point of maximum tension. For a large spring pole, make a small undercut in the compression fiber to release tension from the fiber. **INSTRUCTOR NOTE:** Please use the "Saw Station Guide" in appendix A for a walkthrough of the spring poles saw station, which allows students to practice safely releasing a spring pole. **DISPLAY NEXT SLIDE**
Slide 11: Limbing 	## Limbing **Say:** Limbing is severing limbs from the main stem (bole) of a tree. You may use limbing when the tree is standing or lying on the ground. The tree may be anchored and secure or may not be anchored and may be susceptible to movement. Removing limbs from unanchored trees may cause the tree to roll or move. **DISPLAY NEXT SLIDE**

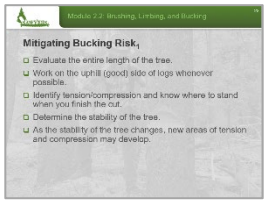
Slide/Action	Content
Slide 12: OHLEC: Limbing 	## OHLEC: Limbing **Say:** The first step in any operation is always OHLEC. Limbing involves asking the following questions: ▪ **Objective:** Where do I want the limb to go? ▪ **Hazards:** What overhead or ground hazards are present? Is the tree anchored in place? ▪ **Leans/binds:** In what 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 if 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? **DISPLAY NEXT SLIDE**
Slide 13: Mitigating Limbing Risk 	## Mitigating Limbing Risk **Say:** To mitigate risk during 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 if removing of a limb will affect tree stability. ▪ Understand that if the stability of the tree changes, new areas of tension and compression may develop. ▪ 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. **DISPLAY NEXT SLIDE**

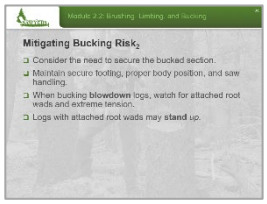
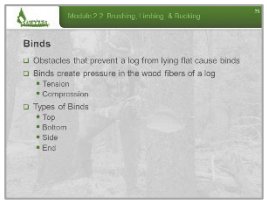
Slide/Action	Content
Slide 14: Limbing Techniques 	## Limbing Techniques **Say:** When it comes to limbing, there are several techniques to use. The techniques we will discuss today are the straight cut, tab cut-limbing, drop cut, hinge cut, and bypass cut. **TRANSITION** Let's talk about each of these. **DISPLAY NEXT SLIDE**
Slide 15: Straight Cut 	## Straight Cut **Say:** A straight cut is one kerf cut from one side of the limb that completely severs the limb. Sawyers use this cut most often when binds are minimal and easily observed. **DISPLAY NEXT SLIDE**
Slide 16: Tab Cut–Limbing 	## Tab Cut—Limbing **Say:** 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. This 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. **DISPLAY NEXT SLIDE**

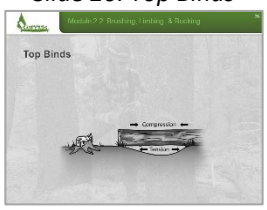
Slide/Action	Content
Slide 17: Drop Cut 	Drop Cut **Say:** Sawyers use the drop cut for pruning and limbing. When trimming heavy or large limbs and branches on trees you intend to leave standing, you should use the drop cut technique. Take extra care to not damage the branch bark ridge or the branch collar, which would interfere with the tree's natural healing response. Properly pruning large tree limbs or branches involves three cuts: • **First cut:** Cut a kerf about a quarter of the way through the limb, away from the bole and from the bottom of the limb. This kerf will keep the wood from splitting, bark from tearing, or a limb from hanging on too long after you make the next cut. • **Second cut:** On the top of the limb, further 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, this is the cut 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 the branch from the bottom up. **DISPLAY NEXT SLIDE**

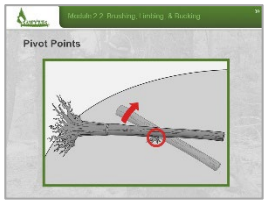
Slide/Action	Content
Slide 18: Hinge  	Hinge **Say:** Create a notch and use a backcut to construct a hinge and directionally fall larger diameter limbs. **Cuts one and two:** Using the top of your bar at approximately a 45-degree angle, create a notch on the side of the limb with compression. **Cut three:** 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. **INSTRUCTOR NOTE:** Relay to the students that the side of the bar being used for the hinge cut is relative to the example in the graphic. **DISPLAY NEXT SLIDE**
Slide 19: Bypass Cut  	Bypass Cut **Say:** The bypass technique is a series of cuts sawyers make on limbs that bypass each other from opposite directions. Sawyers use the technique to maintain connectivity between the cut section and the bole. You can use this technique to remove 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 compression side. Make the second cut on the tension side slightly offset from the first cut (above or below) part way through the limb that bypasses the first cut. **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. **DISPLAY NEXT SLIDE**

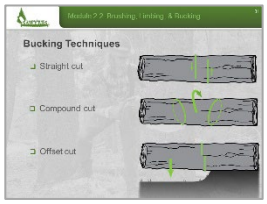
Slide/Action	Content
Slide 20: Bucking 	## Bucking **Say:** Sawing longer logs into shorter lengths is known as bucking. The size of the cut pieces depends on the task at hand. Consider the effort required to remove the log, the intended use for the log, and the task at hand when deciding how big to buck the pieces. **IMPORTANT:** Be aware that the dangers associated with bucking can be equal to or greater than those present during felling operations. **DISPLAY NEXT SLIDE**
Slide 21: OHLEC: Bucking 	## OHLEC: Bucking **Say:** The hazards associated with bucking often tend to be 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 that you need to buck. Bucking involves asking the following questions: ▪ **Objective:** Where do you want the bucked section of log to go? ▪ **Hazards:** What hazards are present? ▪ **Binds:** Are there pivot/contact points? On what 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 the cut is made? ▪ **Cut plan:** What type, location, and sequence of cuts will you use? **DISPLAY NEXT SLIDE**

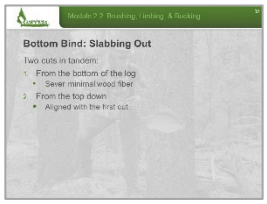
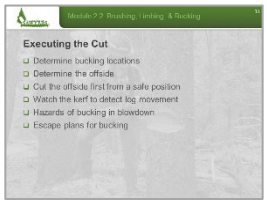
Slide/Action	Content
Slide 22: Video: OHLEC for Chain Saw Limbing and Bucking 	## Video: OHLEC for Chain Saw Limbing and Bucking **PLAY VIDEO** ***Video Debrief*** Discuss the following with the class: **Q:** What is an important consideration before you begin bucking a log? **A:** The stability of the log you need to buck. **Q:** Where is the tension and compression on a log with a top bind? **A:** The tension is on the bottom of the log and the compression/bind is on the top. **DISPLAY NEXT SLIDE**
Slide 23: Mitigating Bucking Risks 1 	## Mitigating Bucking Risks 1 **Say:** Some important tips for mitigating risks during bucking operations are: ▪ 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 new areas of tension and compression may develop as you cut sections. **DISPLAY NEXT SLIDE**

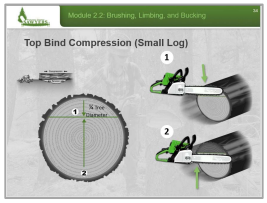
Slide/Action	Content
Slide 24: Mitigating Bucking Risks 2 	Mitigating Bucking Risks 2 **Say:** ▪ Consider the need to secure the bucked section to prevent movement or rollout on steep slopes. ▪ Maintain secure footing, proper body position, and saw handling. ▪ When bucking **blowdown**, be very mindful of attached root wads and extreme tension. If available, consider using heavy equipment to help move severed logs. ▪ Logs with attached root wads may **stand up** during or after you buck them. ▪ When nearing the end of the cut consider reducing chain speed to avoid contacting dirt **DISPLAY NEXT SLIDE**
Slide 25: Binds 	Binds **Say:** 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 section of the log where the wood fibers stretch apart and the chain saw kerf opens as you make the cut. The **compression area** is the section of the log where the wood fibers push together and the kerf closes as you make the cut. It is critical to identify binds before creating a cut plan because the type of bind determines the bucking techniques and procedures you will use. **Transition** There are four types of binds we will discuss next: top, bottom, side, and end. Logs normally have a combination of two or more binds. **DISPLAY NEXT SLIDE**

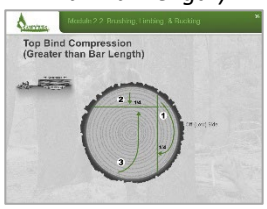
Slide/Action	Content
Slide 26: Top Binds 	## Top Binds **Say:** In top binds, the tension is on the bottom of the log. The compression/bind is on the top. **INSTRUCTOR NOTE:** Discuss the example in the image and any experience with top binds that you may have. **DISPLAY NEXT SLIDE**
Slide 27: Bottom Binds 	## Bottom Binds **Say:** In bottom binds, the tension is on the top of the log, the compression/bind is on the bottom. **INSTRUCTOR NOTE:** Discuss the example in the image and any experience with bottom binds that you may have. **DISPLAY NEXT SLIDE**
Slide 28: Side Binds 	## Side Binds **Say:** In a side bind, tension is exerted sideways on the log. This is often a dangerous situation. When severed, the 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. **INSTRUCTOR NOTE:** Discuss the example in the image and any experience with side binds that you may have. **DISPLAY NEXT SLIDE**

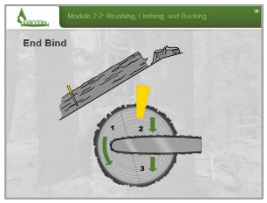
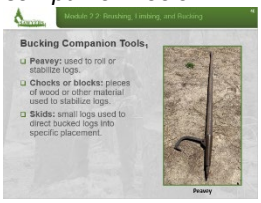
Slide/Action	Content
Slide 29: End Binds 	## End Binds **Say:** In an **end bind**, weight compresses the entire cross section of the log. There is potential here for the kerf to close with any cut that you select. Wedges are imperative. Always be aware that the high side of the log could move or roll 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. **INSTRUCTOR NOTE:** Discuss the example in the image and any experience with side binds that you may have. **DISPLAY NEXT SLIDE**
Slide 30: Pivot Points 	## Pivot Points **Say:** Pivot points are ground features (such as stumps, rocks, and logs) that may cause a bucked log to react in an unexpected way. You will most often encounter pivot points while bucking. They 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 injure you if you do not anticipate or plan for log movement. **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 31: Bucking Techniques 	Bucking Techniques **Say:** 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 DISPLAY NEXT SLIDE

Slide/Action	Content
Slide 32: Bottom Bind: Slabbing Out 	**Bottom Bind: Slabbing Out** **Say:** 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. **DISPLAY NEXT SLIDE**
Slide 33: Executing the Cut 	**Executing the Cut** **Say:** 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.

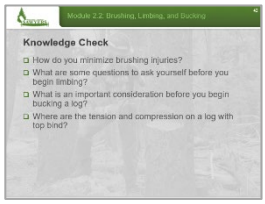
Slide/Action	Content
	▪ **Watch the kerf to detect log movement—**Position yourself so you can detect a slight opening or closing of the kerf; there is no better indicator of the log's reaction on the release cut. If you cannot evaluate the bind, proceed with caution. Cut only far enough to place a wedge. 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. **DISPLAY NEXT SLIDE**
Slide 34: Top Bind Compression (Small Log)  	## Top Bind Compression (Small Log) **Say:** • Standing on the uphill side of the log, start by making a cut from the top down about one quarter of the log diameter. • 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. • Move to your escape path when the cuts meet and the log begins to drop. **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 35: Bottom Bind Compression (Small Log) 	## Bottom Bind Compression (Small Log) **Say:** 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. **DISPLAY NEXT SLIDE**
Slide 36: Top Bind Compression (Greater Than Bar Length) 	## Top Bind Compression (Greater Than Bar Length) Say: 1. Standing on the uphill side, reach over and cut the low or **offside** about one quarter of the log diameter. 2. Line 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. **DISPLAY NEXT SLIDE**
Slide 37: Bottom Bind Compression (Greater Than Bar Length) 	## Bottom Bind Compression (Greater Than Bar Length) **Say:** 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 about 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. **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 38: Bottom Bind Large Diameter Log) 	**Bottom Bind (Large Diameter Log)** **Say:** 1. Standing on the uphill side of the log, reach over and cut the offside about one quarter of the log diameter. 2. Line up with the first cut and cut down about one third of the log diameter. 3. Bore in a short distance and slightly downward to create a small area of uncut fiber near the log center. Continue to bore into the center of the log and then cut downward to finish the bucking cut. 4. If the small area of uncut fiber does not break, cut from the bottom up. 5. Move to you escape path as the kerf closes and the log drops. **DISPLAY NEXT SLIDE**
Slide 39: End Bind 	**End Bind** **Say:** 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 it enough to insert a wedge. 3. Cut the remaining wood downward to finish the cut. **DISPLAY NEXT SLIDE**
Slide 40: Bucking Companion Tools 1 	**Bucking Companion Tools 1** **Say:** Some optional tools used to facilitate moving bucked sections of log include: ▪ **Peavey—**tool used to roll or stabilize logs ▪ **Chocks or blocks—**pieces of wood or other material used to stabilize logs ▪ **Skids—**small logs used to specifically place bucked logs **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 41: Bucking Companion Tools 2 	Bucking Companion Tools 2 **Say:** ▪ **Tongs—**used to move or carry logs ▪ Log chains/ropes/pulleys/winches—used to move or pull logs **INSTRUCTOR NOTE:** Please use the "Saw Station Guide" in appendix A for a walkthrough of the boring and bucking saw stations that allow students to practice vertical and horizontal boring and bucking on a bind-free log. **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 42: Operational Complexity: Putting it All Together 	## Operational Complexity: Putting it All Together **Say:** 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, you must determine whether 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. Even if you think you have the knowledge and experience to implement the cut plan, now is also the time to do a gut check to make sure your head is in the game. Consider seeking mentorship from a more experienced sawyer. **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 43: Knowledge Check 	**Knowledge Check** Allow students a few moments to answer the questions in the student guide. Discuss the correct answers and address any misconceptions. **Q:** How do you mitigate brushing risks? **A:** Answers should include: ▪ Focus on cutting one stem at a time when possible. ▪ Maintain correct chain tension, chain sharpness, and depth gauge clearance to operate as smoothly as possible. ▪ Position yourself so that you are not inline with the kickback arc. ▪ Maintain secure footing, proper body position, and saw handling. **Q:** What are some questions to ask yourself before you begin limbing? **A:** Answers should include: ▪ Where do I want the limb to go? ▪ What hazards exist? Is the tree secured in place? ▪ Which direction does the limb lean? Is it under compression/tension? ▪ Where is my escape path relative to where I expect the limb to go? Where will I go when the log moves? ▪ What type, location, and sequence of cuts will I use? **Q:** What is an important consideration before you begin bucking a log? **A:** The stability of the log you need to buck. **Q:** Where are the tension and compression on a log with top bind? **A:** The tension is on the bottom of the log and the compression/bind is on the top. **DISPLAY NEXT SLIDE**
Slide 44: Summary 	**Summary** **REVIEW** Review the summary objectives listed on the slide. **DISPLAY NEXT SLIDE**

Slide/Action	Content
Slide 45: Questions? 	## Questions **ASK** Do you have any questions about brushing, limbing, and bucking?

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