

USDA Forest Service National Sawyer Training: Developing Thinking Sawyers



Instructors Guide

**USDA Forest Service National Sawyer Training:
Developing Thinking Sawyers**
Module 3.1: Crosscut Saw Basics

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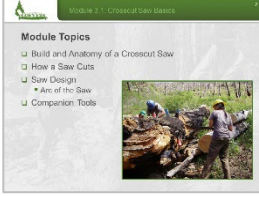
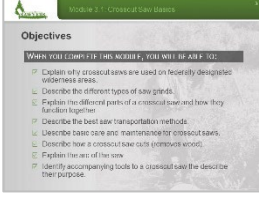
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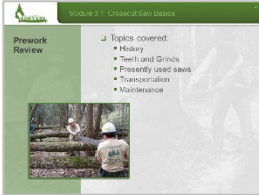
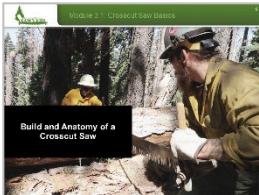
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Module 3.1: Crosscut Saw Basics

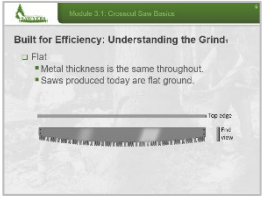
This module covers the basics of crosscut saws, how to care for them, and how to use them.

Slide/action	Content
<p align="center"></p> <p><i>Slide 1: Crosscut Saw Basics</i></p>  <p><i>Slide 2: Module Topics</i></p>  <p><i>Slide 3: Objectives</i></p> 	<h3>Welcome and Introduction</h3> <p>Time: 91 minutes</p> <p>Note: It is important to illustrate to the students that the tools they are learning to use are nearly 100 years old on average, and no more quality tools are being produced.</p> <p>DISPLAY FIRST SLIDE</p> <h3>Introduction</h3> <p>Say:</p> <p>Welcome to Module 3.1 of the “Developing Thinking Sawyers” course. This module covers crosscut saw basics. Crosscut saw design is based on the natural body movements of sawyers. The designs provide the maximum cutting efficiency with the least amount of human effort.</p> <p>DISPLAY NEXT SLIDE</p> <h3>Module Topics</h3> <p>REVIEW</p> <p>Review the module topics on the slide.</p> <p>DISPLAY NEXT SLIDE</p> <h3>Objectives</h3> <p>REVIEW</p> <p>Review the objectives listed on the slide.</p> <p>DISPLAY NEXT SLIDE</p>

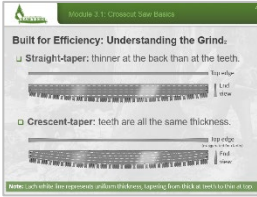
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Slide/action	Content
<p data-bbox="240 380 435 443"><i>Slide 4: Prewrite Review</i></p> 	<p data-bbox="500 380 727 411">Prewrite Review</p> <p data-bbox="500 436 581 464">REVIEW</p> <p data-bbox="500 485 1138 516">Review the topics covered in the prework packet.</p> <p data-bbox="500 541 565 573">Say:</p> <p data-bbox="500 600 1390 705">Some of these topics we will cover again here in the classroom because they are important for safety or have more details you need to know. The rest we will review now.</p> <p data-bbox="500 747 699 774">INSTRUCTOR NOTE:</p> <p data-bbox="500 789 1401 894">Allow students time to read through the summaries and answer the questions in the student guide. Then discuss the answers, confirm the right answers, and correct any misconceptions.</p> <p data-bbox="500 919 776 951">Review Questions</p> <p data-bbox="500 961 1373 993">Q: What act of Congress created the National Preservation System?</p> <p data-bbox="500 999 894 1031">A: The Wilderness Act of 1964.</p> <p data-bbox="500 1056 1414 1125">Q: Can you bend a crosscut saw to make it easier to transport? Why or why not?</p> <p data-bbox="500 1136 1414 1241">A: You can bend a vintage saw in good condition. However, you should not bend one has a kink or nick. Modern crosscut saws are made from softer materials, and therefore you should not bend them.</p> <p data-bbox="500 1266 1227 1297">Q: What can you use to clean and oil your crosscut saw?</p> <p data-bbox="500 1308 1414 1413">A: Kerosene, WD-40, or a citrus-based cleaner. However, be sure to wipe off all citrus-based cleaner when done. The acidic nature of these products can cause rust.</p> <p data-bbox="500 1440 743 1472">DISPLAY NEXT SLIDE</p>
<p data-bbox="240 1528 435 1623"><i>Slide 5: Build and Anatomy of a Crosscut Saw</i></p> 	<p data-bbox="500 1528 1114 1560">Build and Anatomy of a Crosscut Saw</p> <p data-bbox="500 1587 565 1619">Say:</p> <p data-bbox="500 1646 1398 1715">Starting with the anatomy, we'll look at how manufacturers build and design crosscut saws.</p> <p data-bbox="500 1743 711 1774">DISPLAY NEXT SLIDE</p>

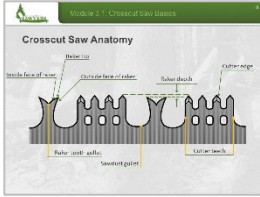
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Slide/action	Content
<p><i>Slide 6: Built for Efficiency: Understanding the Grind 1</i></p> 	<p>Built for Efficiency: Understanding the Grind 1</p> <p>Say:</p> <p>Saw manufacturers grind the sides of vintage saws in three different ways—flat, straight taper, and crescent taper. Each method affects the thickness of the saw in a particular way and has major implications for the overall quality of the saw.</p> <ul style="list-style-type: none">▪ Flat: Sawyers consider flat-ground saws the least desirable. The main disadvantage is that the saw rubs against the wood on either side of the kerf because of its thickness. It also takes more set—the cutter tooth's offset from the plane of the saw—to enable the saw to clear the kerf. For flat-ground saws, the kerf must be wider and therefore requires more energy to use. <p>DISPLAY NEXT SLIDE</p>

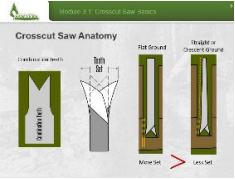
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Slide/action	Content
<p data-bbox="224 380 449 516"><i>Slide 7: Built for Efficiency: Understanding the Grind 2</i></p> 	<p data-bbox="496 380 1166 453">Built for Efficiency: Understanding the Grind 2 Say:</p> <ul data-bbox="548 470 1406 926" style="list-style-type: none">▪ Straight taper: The teeth of straight-taper-ground saws are thicker near the center of the saw than along either end. Straight-taper-ground saws require less set than flat-ground saws and pull through the kerf with less friction.▪ Crescent taper: The difference between the straight taper and crescent taper is that the lines of equal thickness for the straight-taper-ground saw are straight, and those for the crescent-taper-ground saw are concentric to the arc of the saw. This means that the teeth of the crescent-taper-ground saw are all the same thickness, whereas the teeth of the straight-taper-ground saw are thicker toward the center of the saw. <p data-bbox="496 947 586 978">Note:</p> <p data-bbox="496 993 1401 1213">It is important to reinforce with students that crescent-taper-ground saws are no longer in production. These saws provide the maximum cutting efficiency with the least amount of human effort. These saws are the pinnacle of ergonomic design. While you should properly care for all the saws in your organization’s tool cache, you should care for these saws above all others.</p> <p data-bbox="496 1241 711 1266">DISPLAY NEXT SLIDE</p>

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Slide/action	Content
<p data-bbox="209 380 461 447"><i>Slide 8: Crosscut Saw Anatomy</i></p>  <p>The diagram, titled 'Crosscut Saw Anatomy', shows a cross-section of a saw blade with various parts labeled. Labels include: 'Back face of wood' (pointing to the top surface of the wood being cut), 'Cutter teeth' (the primary cutting teeth), 'Raker teeth' (teeth that rake the wood), 'Gullet' (the space between teeth for shavings), 'Raker set' (the angle of the raker teeth), 'Cutter set' (the angle of the cutter teeth), 'Raker depth' (the depth of the raker teeth), and 'Cutter depth' (the depth of the cutter teeth).</p>	<h3 data-bbox="496 380 818 415">Crosscut Saw Anatomy</h3> <p data-bbox="496 432 1386 468">Discuss all parts of the saw in the diagram and introduce how it cuts.</p> <p data-bbox="496 489 586 525">Note:</p> <p data-bbox="496 548 1419 777">To understand how a saw cuts, students should understand the structure of a crosscut saw, including the teeth and rakers, set, raker depth, swaged versus straight rakers, and the gullet. For this section, it is helpful to have on hand a section of a crosscut saw, a spider, a feeler gauge, and other tuning gauges that are appropriate for the geographic area for where students will use the saw.</p> <p data-bbox="496 795 954 831">Activity: Crosscut Saw Anatomy</p> <p data-bbox="496 850 1391 961">Use a crosscut saw or chunk of a broken crosscut saw and pass it around the room while you explain the anatomy and how all parts of the saw are tuned in precise conjunction to work together.</p> <p data-bbox="496 982 565 1018">Say:</p> <p data-bbox="496 1043 1375 1155">The teeth of a saw perform three functions: cutting wood, breaking the material loose, and removing the material from the kerf. To do this, saws have teeth that cut and others that rake.</p> <ul data-bbox="545 1176 1403 1682" style="list-style-type: none"><li data-bbox="545 1176 1370 1287">▪ Cutter teeth: All saws, regardless of the tooth pattern, are made up of two rows of cutting edges. As the saw passes through a log, it scores wood fibers on each side of the kerf.<li data-bbox="545 1297 1391 1526">▪ Rakers: A special kind of tooth, the raker, allows the cutter teeth to work more effectively with less effort. Even though the rakers don't sever fiber, they perform the other two functions of saw teeth: chiseling the cut fiber and removing it from the log. Rakers remove material whether the sawyer is pushing or pulling the saw.<li data-bbox="545 1537 1403 1682">▪ Gullets: Gullets have a rounded shape so shavings will bend rather than break. The gullet must be large enough to store all the shavings until the gullet clears the log and the shavings fall free.

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Slide/action	Content
<p data-bbox="212 646 461 779"><i>Slide 9: Crosscut Saw Anatomy – Combination Teeth and Set</i></p> 	<ul data-bbox="548 386 1414 533" style="list-style-type: none">▪ Arc of the saw: The teeth of most crosscut saws lie on an arc of a circle. This is called the arc of the saw. This arc makes cutting faster, easier, and smoother. The arc of the saw works in conjunction with the arc of the sawyer's arm. <p data-bbox="500 575 708 600">DISPLAY NEXT SLIDE</p> <p data-bbox="500 646 1240 678">Crosscut Saw Anatomy (Combination Teeth and Set)</p> <p data-bbox="500 701 565 737">Say:</p> <ul data-bbox="548 764 1414 1381" style="list-style-type: none">▪ Combination Teeth: Combination teeth are a compromise between cutter and raker teeth as they both score and remove wood fiber depending on the direction they are moving-- usually with greater sawyer effort-- for more specialized cutting circumstances. Combination teeth come in different sizes and shapes depending on their intended use.▪ Set is the cutter tooth's offset from the plane of the saw, or the amount of bend hammered into the tip of the cutter teeth during the sharpening process. The amount of set required, measured in thousandths of an inch, varies by the grind of the blade, tooth pattern, local wood fiber characteristics, and is ultimately the sawyer's preference. In saws with a flat grind, greater set is usually needed to achieve an efficient, smooth cutting motion with less friction when compared to a straight taper or crescent taper where the saw blade is thickest at the teeth (figure 3.1.4a). <p data-bbox="500 1423 708 1449">DISPLAY NEXT SLIDE</p>

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Slide 10: Crosscut Saw Tooth Patterns



Crosscut Saw Tooth Patterns

Say:

The type and frequency of Cutter teeth to Raker teeth, or the type and frequency of Combination teeth used in series along the blade is known as the Tooth Pattern (figure 3.1.4b). Saw designers had to consider questions such as:

- What is the anticipated size of the log or tree?
- Is it for hardwood or softwood?
- Are the gullets far enough apart to effectively pick up all the fibers severed by the cutters?
- Is the tooth strong enough for the intended work?
- Is there enough room to sharpen and maintain the teeth and rakers?
- What is the best way to reduce vibration and chatter so the saw cuts smoothly?

Among the many attributes of a specific tooth pattern, the variable with the greatest influence on saw performance is tooth spacing. Generally, the longer the saw, the larger the teeth and the wider the space between teeth. Knowing the effect of tooth spacing helps the Sawyer select the proper length of saw. Larger crosscut saws with more space between the teeth work poorly on smaller timber. Likewise, a short saw with closely spaced teeth doesn't work well on large trees or logs.

Following tooth spacing, the type of pattern further dictates the saw's intended use. Cutter, raker, and combination teeth evolved into many different patterns to achieve greater cutting efficiency in different situations.

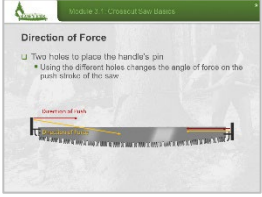

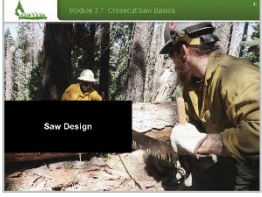
The **Plain Tooth (or Peg Tooth)** is the most basic tooth pattern and has been used for centuries. It consists of alternately set triangular teeth. Being simple, it is easy to manufacture and maintain, but lacks in performance when compared to other patterns. Generally, the teeth are smaller, relative to other tooth patterns, and are consequently used for small diameter timber in dry or very hard wood, or cuts needing a higher degree of precision.

The **Lance Tooth (or Peg and Raker)** is the most efficient cutting pattern in soft wood. It consists of groups of four alternately set cutters separated by an unset raker with gullets on each side. It is best suited for larger diameter green timber in soft wood species such as fir, spruce, and redwood.

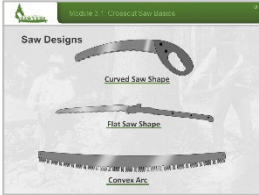
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	<p>The Perforated Lance is a good all-around pattern for working in medium and large diameter mixed timber locations where both soft and hard wood species are encountered. It consists of groups of four alternately set cutters separated by an unset raker with gullets on each side. The opposing set pairs of lances bridged together gives increased tooth stiffness and forms the perforations that give the pattern its name. It works well for all but very hard and frozen wood.</p> <p>The Champion Tooth is best suited for cutting medium and large timber diameters in hardwood species and is popular in the hardwood regions of North America. It consists of two alternately set cutter teeth and an unset raker with a gullet between them. It works well in even the hardest dry or frozen wood.</p> <p>The M Tooth pattern cuts aggressively (requiring more force) and is historically best used for cutting dry medium to hard, hardwood species. Modern M Tooth variations work in many different species. It consists of pairs of combination teeth separated by a “U” shaped gullet. The outer edges of the teeth (the legs of the M) are vertical and act like rakers. The inside edges of the M are filed to a bevel, making a point.</p> <p>The Great American Tooth pattern cuts slightly less aggressively than the M tooth, but still more aggressively than a Champion tooth. It is typically employed in medium and small diameter timber, in dry, medium to hard hardwood species. It is a type of combination tooth pattern consisting of one plain tooth between two opposing set combination teeth, separated by a “U” or slightly “V” shaped gullet. This pattern is preferable for cutting at an angle closer to 45 degrees to the fiber such as when needed for an exaggerated compound cut, (which will be discussed in more detail later), or for a sawn undercut because of its tendency to more easily start and hold an angle throughout the cutting process.</p> <p>DISPLAY NEXT SLIDE</p>

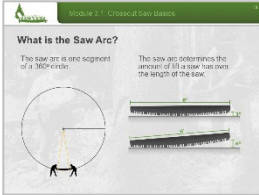
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Slide/action	Content
<p><i>Slide 11: Direction of Force</i></p> 	<p>Direction of Force</p> <p>Say:</p> <p>There are two holes on each end of the bucking saw to change the angle of force on the push stroke of the saw. Placing the pin in the upper hole and using the top portion of the handle will result in directing more force into the teeth and a more aggressive cut. Cutting like this makes your partner's pull stroke more arduous. Using this method demands more muscle but does cut quickly.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 12: Video: How a Saw Cuts</i></p> 	<p>Video: How a Saw Cuts</p> <p>Say:</p> <p>We will now watch a video to show the parts of the saw in action.</p> <p>Video Debrief</p> <p>Discuss the following with the class:</p> <p>Q: Explain what would happen if the raker was the same length as the saw tooth.</p> <p>A: The saw would not cut because the rakers would prevent contact with the wood surface.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 13: Saw Design</i></p> 	<p>Saw Design</p> <p>Say:</p> <p>All saws are designed for you to follow the arc that the teeth are built on. Following the arc of the saw engages all the saw's teeth and rakers throughout the entire kerf instead of only engaging teeth in the center of the saw if the sawyer were to pull the saw completely flat. This allows the sawyer to cut faster and more efficiently.</p> <p>DISPLAY NEXT SLIDE</p>


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Slide/action	Content
<p data-bbox="250 380 423 443"><i>Slide 104: Saw Designs</i></p> 	<p data-bbox="496 380 670 411">Saw Designs</p> <p data-bbox="496 436 565 468">Say:</p> <p data-bbox="496 495 1349 604">Shown here are three different shaped saw blades with different handles. The different saw shapes—curved, flat, and convex arc—dictate the length or type of kerf they are designed to cut.</p> <p data-bbox="496 632 1414 814">The curved saw shape helps you engage more teeth in a short kerf and prevent over-pulling. As the sawyer pulls the saw, the angle at which each tooth interacts with the wood becomes more aggressive toward the tip of the blade. The curved tip also allows sawyers to perceive when the saw blade is about to run out of length.</p> <p data-bbox="496 842 1390 982">The flat-saw shape works well for creating a precise kerf by allowing you to make flat pulls that reduce complex blade movement, though the flat shape compromises its cutting efficiency in long kerfs. A flat blade works best for cutting hinges into small-diameter trees.</p> <p data-bbox="496 1010 1406 1157">The crosscut saw with the convex arc maximizes cutting efficiency in a long kerf by isolating the number of teeth in contact with the wood over the saw's greater length. This allows you to use minimal effort to pull a large saw while creating a deep, long kerf.</p> <p data-bbox="496 1184 667 1215">Transition:</p> <p data-bbox="496 1243 1386 1310">The felling saw on the bottom is a vintage saw built on an arc. This is done for a very specific reason.</p> <p data-bbox="496 1337 711 1369">DISPLAY NEXT SLIDE</p>

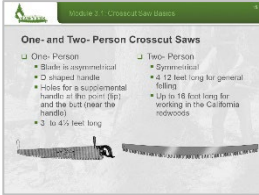
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Slide/action	Content
<p data-bbox="212 380 459 443"><i>Slide 15: What is the Saw Arc?</i></p> 	<p data-bbox="496 380 797 411">What is the Saw Arc?</p> <p data-bbox="496 436 565 468">Say:</p> <p data-bbox="496 495 1401 562">A saw radius determines the amount of arc (or lift) a saw has over the length of the saw.</p> <p data-bbox="496 590 1406 810">An efficient sawyer or saw team follows the arc of the saw as they use it. For a human body to pull a 4-foot saw, our arms naturally lift. As you pull, your arms naturally follow the arc of the saw. The saw team will naturally lift the saw 4 inches over 4 feet of pull. Manufacturers build crosscut saws with ergonomics in mind to create a smooth and efficient saw.</p> <p data-bbox="496 936 1341 1003">Vintage crosscut saws are built on a consistent radius. This radius creates an arc over the length of the saw.</p> <p data-bbox="496 1035 1411 1377">Note: Have the students imagine the teeth of a saw following the circle depicted in the figure. The rock of the saw is upward in the standard bucking position but downward when underbucking or sweeping outward when felling. This is because the teeth are always on the outside of the circle and the teeth are what dictates how we rock the saw. New sawyers will tend to overly exaggerate how the saw should be pulled or rocked during the cut. Instructors should emphasize following the arc of the teeth of the saw on their strokes to illustrate this concept.</p> <p data-bbox="496 1402 708 1434">DISPLAY NEXT SLIDE</p>

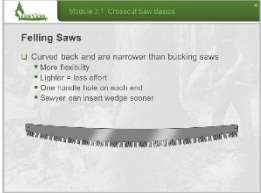

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Slide/action	Content
<p data-bbox="207 380 467 443"><i>Slide 16: Video: Arc of the Saw</i></p> 	<p data-bbox="500 380 808 411">Video: Arc of the Saw</p> <p data-bbox="500 436 565 468">Say:</p> <p data-bbox="500 493 1414 642">Again, to reinforce how the saw is designed to cut most effectively, we have a short video for demonstration. Pay attention to how this video shows the slight rocking of the saw during double bucking and how this rocking motion follows the arc that the teeth are built on.</p> <p data-bbox="500 667 699 699">Video Debrief</p> <p data-bbox="500 724 963 751">Discuss the following with the class:</p> <p data-bbox="500 777 1349 804">Q: How would the saw work if the sawyers did not follow the arc?</p> <p data-bbox="500 814 1386 884">A: The saw will bind less as the sawyers transition from push to pull, and the teeth will be engaged more fully through-out the kerf.</p> <p data-bbox="500 909 667 940">Transition:</p> <p data-bbox="500 966 1390 1073">Now that we know how the saw cuts, let's look at the different types of crosscut saws and the companion tools that crosscut sawyers commonly use.</p> <p data-bbox="500 1098 711 1129">DISPLAY NEXT SLIDE</p>


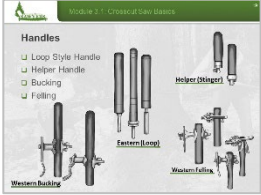
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Slide/action	Content
<p>Slide 17: One- and Two-Person Crosscut Saws</p>  <p>The screenshot shows a slide with the following text:</p> <ul style="list-style-type: none">One- and Two-Person Crosscut SawsOne-Person<ul style="list-style-type: none">Blade is asymmetricalD shaped handlehole for a supplemental handle at the point (tip) and the butt (near the handle)3 to 4 1/2 feet longTwo-Person<ul style="list-style-type: none">Symmetrical4 to 12 feet long for general fellingUp to 16 feet long for working in the California redwoods	<p>One- and Two-Person Crosscut Saws</p> <p>Say:</p> <ul style="list-style-type: none">▪ One-person crosscut saw—A one-person crosscut saw is asymmetrical. The saw has a D-shaped handle and has holes for a supplemental handle at the tip and near the D-handle. These saws are usually 3- to 4½-feet long.▪ Two-person crosscut saws—Two-person crosscut saws are symmetrical and are 4- to 12- feet long for general sawing. Some are up to 16-feet long for working in the California redwoods. <p>Note: Saw manufacturers made saws from 4- to 7-feet long in ½-foot increments and made saws longer than 7-feet long in 1-foot increments.</p> <p>Many vintage saws have teeth all the way to the ends, but saws manufactured today do not. Using saws with teeth all the way to the ends of the saw allows for the greatest versatility for starting or ending a cut, for underbucking, and for using a shorter saw.</p> <p>Historically, manufacturers used 15-gauge (.070-inch) steel for shorter 4- to 5-foot, two-person saws, and they used a thicker, 14-gauge (.078-inch) steel for 5- to 7-foot saws. Longer saws were typically 13-gauge (.094-inch). These thicknesses are measured at the tooth and represent the thickest metal in the saw. Straight-taper and crescent-taper saws were often a full five gauges thinner at the center back of the saw.</p> <p>DISPLAY NEXT SLIDE</p>


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Slide/action	Content
<p><i>Slide 18: Felling Saws</i></p>  <p>Felling Saws</p> <ul style="list-style-type: none">↳ Curved back and are narrower than bucking saws• More flexibility• Lighter = less effort• Clear handle hole on each end• Sawyer can insert wedge sooner	<p>Felling Saws</p> <p>Say:</p> <p>Felling saws are lighter and more flexible than bucking saws. The curved back of a felling saw makes the saw lighter and allows the sawyer to insert a wedge sooner. The flexibility of the felling saw allows it to conform on a horizontal cut to the pull. As you pull the saw towards yourself, the saw rises, keeping it from binding.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 19: Bucking Saws</i></p>  <p>Bucking Saws</p> <ul style="list-style-type: none">↳ Straight back• Heavier and stiffer• Allows the teeth to engage in the wood more aggressively• Added metal from the straight back adds rigidity• Improves the ease of single bucking	<p>Bucking Saws</p> <p>Say:</p> <p>Bucking saws have a straight back so they are heavier and stiffer. For example, a 6-foot Simonds 513 felling saw weighs 6¼ pounds, and a 6-foot Simonds 503 bucking saw weighs 8½ pounds.</p> <p>The straight back of a bucking saw gives the saw the following characteristics:</p> <ul style="list-style-type: none">▪ The added weight allows the teeth to engage in the wood more aggressively thus bucking faster.▪ The added metal from the straight back adds rigidity to the saw and thereby improves the ease of single bucking. <p>DISPLAY NEXT SLIDE</p>


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Slide/action	Content
<p>Slide 20: Companion Tools</p>  A photograph of a logger in a forest setting, wearing a yellow jacket and a cap, kneeling and working with a crosscut saw. The slide title "Companion Tools" is overlaid on the bottom left of the image.	<h3>Companion Tools</h3> <p>Say:</p> <p>Companion tools to the crosscut saw include:</p> <ul style="list-style-type: none">▪ Saw handles▪ Saw sheaths▪ Wedges▪ Lubricants and solvents▪ Handsaws▪ Axes <p>DISPLAY NEXT SLIDE</p>
<p>Slide 21: Handles</p>  A technical diagram showing various types of crosscut saw handles. The diagram includes labels for "Loop Style Handle", "Helper Handle", "Backing", "Felling", "Western Bucking", "Eastern Barrel", "Holzer (Hager)", and "Western Felling".	<h3>Handles</h3> <p>Say:</p> <p>Crosscut handles are typically hardwood with a metal bracket containing either a pin or a loop to secure the saw to the handle. The length of the handle, where it attaches to the saw, and where you grip it, dictates the transfer of energy into the saw.</p>



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	<p>Note: For this part of the lesson, have sets of handles available to demonstrate the different types and where they attach to the saw.</p> <ul style="list-style-type: none">▪ Loop handles: Loop handles have a threaded metal rod on one end and a linear loop on the other end. The threaded end inserts into the bottom of a wooden handle. A nut inside the wooden handle secures the threaded bolt. The crosscut saw fits inside the linear loop opening. Many manufacturers made crosscut saws with notches/cutouts on the ends of the saw to position the handles. By turning the wing nut, the threaded rod moves in or out, which tightens or loosens the saw's placement in the handle.▪ Helper handles: Helper handles attach with a pin through a hole in the body of the saw and are most common on one-person saws.▪ Bucking handles: Longer than felling handles, bucking handles enable you to grip the saw below or above the teeth depending on footing, cutting height etc.▪ Felling handles: Shorter than bucking handles, felling handles do not catch your belt or suspenders while pulling the saw handle past your body. <p>DISPLAY NEXT SLIDE</p> <p>Slide 22: Sheaths</p>  <p>Sheaths</p> <p>Say:</p> <p>Sheaths protect the saw and prevent it from causing damage or inflicting injury to the sawyer. You should sheath saws as often as possible unless you are using them or they are in storage.</p> <p>Saw sheaths can be rigid or flexible.</p>

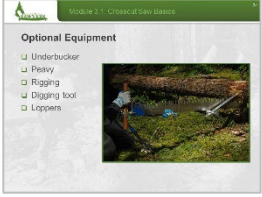
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Slide/action	Content
<p data-bbox="233 989 440 1020"><i>Slide 23: Wedges</i></p> 	<ul data-bbox="548 386 1403 695" style="list-style-type: none">▪ Rigid sheaths—Rigid sheaths are often easier for hikers to carry for long distances because the saw blade doesn't flop up and down on the hiker's shoulder. Rigid sheaths can cover just the saw's teeth or the entire blade.▪ Flexible sheaths—Flexible sheaths provide protection while allowing saws to be bent over pack animals. Flexible sheaths also are lightweight and easier to carry when they are not on the saw. <p data-bbox="500 709 586 741">Note:</p> <p data-bbox="500 768 1390 877">It is best to avoid bending saws if you can. Use caution with a flexible sheath; constant flexing of a saw can lead to metal fatigue and ultimately fracture the saw.</p> <p data-bbox="500 900 708 926">DISPLAY NEXT SLIDE</p> <p data-bbox="500 1003 607 1035">Wedges</p> <p data-bbox="500 1062 561 1094">Say:</p> <p data-bbox="500 1121 1409 1268">Wedges come in steel, soft metals like aluminum or magnesium, and plastic. Wedges also come in a variety of thicknesses and lengths. You should select wedges based on the type of work you are doing and the timber type with which you are working.</p> <ul data-bbox="548 1295 1409 1717" style="list-style-type: none">▪ Plastic wedges: Plastic wedges are the most commonly available, inexpensive, and lightweight. Plastic wedges also rarely damage the saw because the wedge will become damaged first.▪ Hanging wedges: Hanging wedges are used as a pair—the sawyer drives one across the kerf at the 10 o'clock position and the other across the kerf at the 2 o'clock position. Hanging wedges are tied together to ensure that when the log is severed, they remain hanging by the cord that ties them together. This helps prevent the hanging wedges from falling onto and damaging the saw. <p data-bbox="500 1740 708 1766">DISPLAY NEXT SLIDE</p>

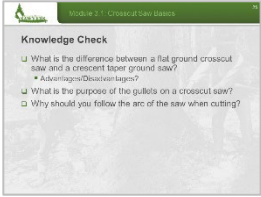
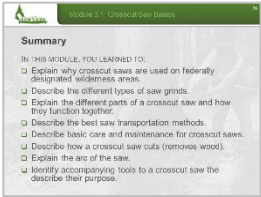

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Slide/action	Content
<p><i>Slide 24: Lubricants and Solvents</i></p> 	<h3>Lubricants and Solvents</h3> <p>Say:</p> <p>Most sawyers choose to carry some sort of lubricant with them when they are operating a crosscut saw. Oil-based lubricants often also act as solvents, and therefore you can use them to cut pitch, lubricate the saw, and coat the saw to prevent rust.</p> <p>Citrus-based solvents are biodegradable, and WD-40 applies well because of its aerosol application.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 25: Handsaws</i></p> 	<h3>Handsaws</h3> <p>Say:</p> <p>When working with traditional tools, using the most efficient tool for the job is paramount. Knowing when it is better to use an ax, handsaw, or crosscut saw is based on an individual sawyer's experience and comfort level.</p> <p>Some sawyers prefer a handsaw with a curved blade, while others prefer a handsaw with a straight blade. Curved saws are easier to use for limbing than straight-bladed saws. A straight-bladed saw is more effective for underbucking and any cutting operation where you may need to construct a hinge into a tree.</p> <p>Example uses:</p> <ul style="list-style-type: none">▪ Limbing▪ Cutting small trees▪ Removing brush▪ Underbucking▪ Making a final cut to sever a log▪ Removing a spring pole▪ Overhead cutting <p>DISPLAY NEXT SLIDE</p>

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Slide/action	Content
<p>Slide 26: <i>Optional Equipment</i></p>  <p>The screenshot shows a presentation slide with the title 'Optional Equipment' and a list of items: Underbucker, Peavy, Rigging, Digging tool, and Loppers. To the right of the list is a photograph of a person in a forest using a tool to work on a log.</p>	<p>Optional Equipment</p> <p>Say:</p> <p>Here are some of the more commonly used tools, though there are many from which to choose:</p> <ul style="list-style-type: none">▪ Underbucker: At times, you will need to underbuck a log due to its binds. For these instances, some crews choose to carry a mechanical underbucker, such as the one pictured here. Using this tool or an ax handle allows you to underbuck a log without having to support the full weight of the saw.▪ Peavy: A peavy is a kind of leveraging tool that allows saw teams to roll medium and even large logs by hand. Surprisingly effective, a peavy greatly diminishes the risk of back injuries when moving large material.▪ Rigging: Rigging is the use of various rope and pulley configurations in more complex operations. Rigging can provide extra safety or a solution for moving a log or tree when other tools fall short. Rigging operations require special training and safety considerations.▪ Digging tool: There are times when log removal is not possible without a digging tool. For example, you would need a digging tool if a log was laying directly on the ground or in a cupped trench, and the only way to cut the log in pieces is to dig out a spot in the ground for the crosscut saw to pass through.▪ Loppers: Sawyers often carry loppers with a crosscut saw and use them to remove brush from alongside the trail, cut small limbs, and clear the work area to operate the crosscut saw. <p>DISPLAY NEXT SLIDE</p>

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Slide/action	Content
<p><i>Slide 27: Knowledge Check</i></p>  <p>The slide contains a 'Knowledge Check' section with the following questions:</p> <ul style="list-style-type: none">What is the difference between a flat ground crosscut saw and a crescent taper ground saw? * Advantages/Disadvantages?What is the purpose of the gullets on a crosscut saw?Why should you follow the arc of the saw when cutting?	<h2>Knowledge Check</h2> <p>Say:</p> <p>Take a few moments to answer the knowledge check questions in your student guide, then we will discuss the answers.</p> <p>Note: Correct any wrong answers and emphasize the correct answers.</p> <p>Q: What is the difference between a flat-ground saw and a crescent-taper-ground saw? What are some advantages and disadvantages? A: Flat: The saw has equal thickness throughout. Disadvantage: The saw rubs against the wood on either side of the kerf because of its thickness. Crescent taper: The spine of the saw is much thinner toward the top and center. Advantage: They require less set than flat-ground saws, and therefore cut a thinner kerf with less friction.</p> <p>Q: What is the purpose of the gullets on a crosscut saw? A: They bend and store the wood shavings until the gullet clears the kerf and the shavings fall out.</p> <p>Q: Why should you follow the arc of the saw when cutting? A: To ensure all the saw's teeth and rakers are fully engaged throughout the entire kerf to maximize efficiency.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 28: Summary</i></p>  <p>The slide contains a 'Summary' section with the following objectives:</p> <ul style="list-style-type: none">In this module, you learned to:<ul style="list-style-type: none">Explain why crosscut saws are used on federally designated wilderness areas.Describe the different types of saw grinds.Explain the different parts of a crosscut saw and how they function together.Describe the best saw transportation methods.Describe basic care and maintenance for crosscut saws.Describe how a crosscut saw cuts (removes wood).Explain the arc of the saw.Identify accompanying tools to a crosscut saw the describe their purpose.	<h2>Summary</h2> <h2>Review</h2> <p>Review the summary objectives on the slide.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 29: Questions?</i></p>  <p>The slide features a photograph of two sawyers in a forest. The text 'QUESTIONS?' is overlaid on the bottom of the image.</p>	<h2>Questions</h2> <p>Say:</p> <p>Do you have any questions about crosscut saw basics?</p> <p>DISPLAY NEXT SLIDE</p>

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