

USDA Forest Service National Sawyer Training: Developing Thinking Sawyers



Instructors Guide

USDA Forest Service National Sawyer Training
Developing Thinking Sawyers
Module 5: Fireline Operations

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**USDA Forest Service National Sawyer Training:
Developing Thinking Sawyers**
Module 5: Fireline Operations

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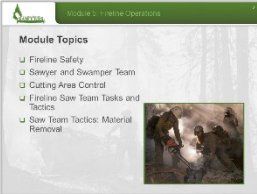

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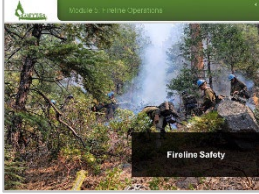
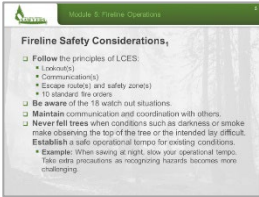
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Slide/action	Content
	<h3>Welcome and Introduction</h3> <p>Time: 73 minutes</p> <p>Note: Do not read the slides to the students, speak in a conversational tone, and use the slides to actively engage students in a two-way conversation. Add the occasional brief story or anecdote from your experience to illustrate key concepts.</p> <p>DISPLAY FIRST SLIDE</p>
<p><i>Slide 1: Fireline Operations</i></p> 	<h3>Introduction</h3> <p>Say:</p> <p>Welcome to Module 5 of the “Developing Thinking Sawyers” course. This module is an introduction to wildland fire chain saw operations.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 2: Module Topics</i></p> 	<h3>Module Topics</h3> <p>REVIEW</p> <p>Review the module topics listed on the slide.</p> <p>Transition:</p> <p>Let’s review the objectives we have for this module.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 3: Objectives</i></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="215 384 456 415"><i>Slide 4: Fireline Safety</i></p>  A photograph showing a firefighter in a forest setting, likely near a fireline. The text "Fireline Safety" is overlaid on the bottom right of the image.	<h3 data-bbox="500 369 743 407">Fireline Safety</h3> <p data-bbox="500 432 565 470">Say:</p> <p data-bbox="500 491 1403 793">Operational tempo and fatigue are common factors that can lead to decreased awareness and increased potential for accidents for firefighters. Wildland fire chain saw sawyers should follow the same processes and safety practices as those used during nonfire chain saw operations. Managing the many hazards on the fireline along with operational activities associated with fire suppression often result in increased levels of complexity during saw operations. There will be more people and moving parts that may become distracting.</p> <p data-bbox="500 819 711 844">DISPLAY NEXT SLIDE</p>
<p data-bbox="215 909 456 961"><i>Slide 5: Fireline Safety Considerations₁</i></p>  A slide titled "Fireline Safety Considerations" with a list of bullet points. The text is partially obscured by a light gray box.	<h3 data-bbox="500 909 938 947">Fireline Safety Considerations₁</h3> <p data-bbox="500 972 565 1010">Say:</p> <p data-bbox="500 1031 846 1068">Things to consider include:</p> <ul data-bbox="529 1089 1403 1612" style="list-style-type: none"><li data-bbox="529 1089 1403 1192">▪ Follow the principles of LCES—lookout(s), communication(s), escape route(s), and safety zone(s); and the 10 standard fire orders.<li data-bbox="529 1213 1101 1251">▪ Be aware of the 18 watch out situations.<li data-bbox="529 1272 1403 1375">▪ Maintain communication and coordination with other saw teams, crew members, and other resources (heavy equipment, fixed-wing retardant drops, helicopter bucket drops, etc.)<li data-bbox="529 1396 1403 1457">▪ Never fell trees when conditions such as darkness or smoke make observing the top of the tree or the intended lay difficult.<li data-bbox="529 1478 1403 1612">▪ Establish a safe operational tempo for existing conditions.<ul data-bbox="630 1499 1403 1612" style="list-style-type: none"><li data-bbox="630 1499 1403 1612">• Example: When sawing at night, slow your operational tempo. Take extra precautions as recognizing hazards becomes more challenging.

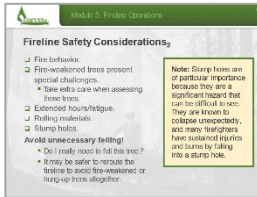
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Slide/action

Content

Slide 6: Fireline Safety Considerations₂



Fireline Safety Considerations₂

Say:

- **Fire behavior.**
- **Fire-weakened** trees present special challenges, especially when hung up. Take extra care while assessing trees, particularly for overhead hazards, root systems, and the condition of wood fiber at the hinge.
- **Extended** hours/fatigue.
- **Rolling** materials.
- **Stump** holes.

Avoid any unnecessary felling! Ask the question, “Do I really need to fell this tree?” It may be safer to reroute the fireline and avoid fire-weakened or hung-up trees altogether.

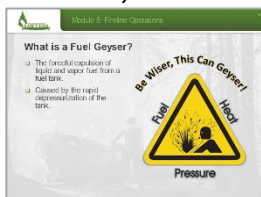
Note: Stump holes are of particular importance because they are a significant hazard that can be difficult to see. They are known to collapse unexpectedly, and many firefighters have sustained injuries and burns by falling into a stump hole.

DISPLAY NEXT SLIDE

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Slide 7: What is a Fuel Geysers?



What is a Fuel Geysers?

Say:

A **fuel geysers** is the forceful expulsion of liquid and vapor fuel from the fuel tank caused by the rapid depressurization of the tank. Heat and agitation cause the pressure increase. A delayed fuel geysers can occur after opening the fuel container.

Fuel geysers can occur anytime fuel, heat, and pressure combine in fuel transport containers or small, gas-powered engines, such as chain saws, leaf blowers, and portable pumps. They have resulted in injury when sprayed fuel and vapor have ignited.

What do I need to know to protect myself?

Along with the fueling procedures listed above, take the following precautions when fuel, heat, and pressure are present (these steps may prevent significant burns in the event of fuel spray):

- Always assume fuel tanks and fuel containers are pressurized.
- Always check fuel levels before opening the fuel tank or filler cap; more than half a tank may geysers.
- Cover the fuel cap with a rag when opening to contain potential fuel geysers spray.
- Be extra vigilant when equipment is running poorly, and the fuel level is above half a tank.
- Do not use fuel older than 1 month.

If the equipment is running poorly or you suspect vapor lock:



- Do not open the fuel cap. Relieving the pressure does not alleviate a **vapor lock**.
- Check the fuel level through the tank or use the bar oil level to gauge the fuel level.
- If the fuel level is more than half full, **do not open the tank!**
- Allow the equipment to thoroughly cool. This can take more than 45 minutes.
- Restart the equipment when it is cool.

It is **your** job to protect yourself and others. Know how to handle your equipment to avoid fuel geysers anytime fuel, heat, and pressure are present.


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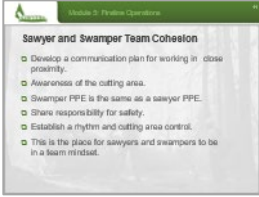

Slide/action	Content
<p data-bbox="228 369 444 428"><i>Slide 8: Video: Fuel Geysering Examples</i></p> 	<p data-bbox="496 369 565 407">Say:</p> <p data-bbox="496 436 1414 506">Now, we will watch a video showing two examples of a fuel geysers in a lab-controlled scenario.</p> <p data-bbox="496 533 1398 611">After the video, ask the class if they have questions and provide them with answers. Note:</p> <p data-bbox="496 638 1365 707">The content of this video is covered in the student guide under the heading “What is a Fuel Geysers?”</p> <p data-bbox="496 737 711 766">DISPLAY NEXT SLIDE</p>
<p data-bbox="204 812 469 905"><i>Slide 9: Fireline Personal Protective Equipment (PPE)</i></p> 	<p data-bbox="496 812 1143 850">Fireline Personal Protective Equipment (PPE)</p> <p data-bbox="496 875 565 913">Say:</p> <p data-bbox="496 930 1360 999">Sawyers and swamper must wear all required personal protective equipment (PPE) for fireline operations.</p> <p data-bbox="496 1026 695 1056">INSTRUCTOR NOTE</p> <p data-bbox="496 1077 1094 1106">Read through the fireline PPE required below:</p> <ul data-bbox="529 1134 1403 1850" style="list-style-type: none"><li data-bbox="529 1134 1403 1287">▪ Head protection<ul data-bbox="626 1178 1403 1287" style="list-style-type: none"><li data-bbox="626 1178 1403 1247">• Chain saw: helmet meeting National Fire Protection Association (NFPA) 1977<li data-bbox="626 1262 1403 1287">• Crosscut saw: same as chain saw<li data-bbox="529 1302 1403 1455">▪ Eye protection<ul data-bbox="626 1346 1403 1455" style="list-style-type: none"><li data-bbox="626 1346 1403 1415">• Chain saw: American National Standards Institute (ANSI) Z87.1 safety glasses or equivalent (mesh bug-eye type)<li data-bbox="626 1430 1403 1455">• Crosscut saw: same as chain saw<li data-bbox="529 1470 1403 1623">▪ Hearing protection<ul data-bbox="626 1514 1403 1623" style="list-style-type: none"><li data-bbox="626 1514 1403 1583">• Chain saw: hearing protection required for gasoline-powered chain saw use<li data-bbox="626 1598 1403 1623">• Crosscut saw: none required<li data-bbox="529 1638 1403 1757">▪ Hand protection<ul data-bbox="626 1682 1403 1757" style="list-style-type: none"><li data-bbox="626 1682 1403 1707">• Chain saw: leather gloves<li data-bbox="626 1722 1403 1757">• Crosscut saw: same as chain saw<li data-bbox="529 1772 1403 1850">▪ Shirt<ul data-bbox="626 1816 1403 1850" style="list-style-type: none"><li data-bbox="626 1816 1403 1850">• Chain saw: flame-resistant, long-sleeved shirt

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Slide/action	Content
<p>Slide 10: The Sawyer and Swamper Team</p> 	<ul style="list-style-type: none">• Crosscut saw: same as chain saw <ul style="list-style-type: none">▪ Pants<ul style="list-style-type: none">• Chain saw: flame-resistant, long pants• Crosscut saw: same as chain saw▪ Leg protection<ul style="list-style-type: none">• Chain saw: chaps meeting the requirements of Forest Service Specification 6170-4; chaps overlap boots at least 2 inches• Crosscut saw: none required▪ Boots<ul style="list-style-type: none">• Chain saw: cut-resistant or leather, laced, 8-inch-high boots that provide ankle support and nonskid soles• Crosscut saw: same as chain saw <p>DISPLAY NEXT SLIDE</p> <h3>The Sawyer and Swamper Team</h3> <p>Say:</p> <p>Constructing a fireline can generate large quantities of cut material that someone will need to move. To facilitate this, one or more people work with a sawyer to help remove the cut materials by dragging or throwing, etc. These individuals are commonly referred to as swampers. When working together, sawyers and swampers are referred to as a saw team.</p> <p>DISPLAY NEXT SLIDE</p>

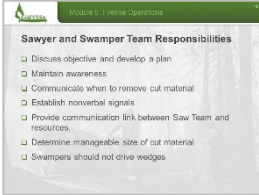

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Slide/action	Content
<p><i>Slide 11: Sawyer and Swamper Team Cohesion</i></p> 	<h3>Sawyer and Swamper Team Cohesion</h3> <p>Say:</p> <p>The sawyer may need to operate the chain saw near the swamper. This will present unique safety considerations. The 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.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 72: Chainsaw Cuts</i></p> 	<h3>Chainsaw Cuts</h3> <p>Say:</p> <p>Each year, some swampers sustain lacerations to their hands, arms, or legs from working too close to a running chain saw. Chain saw cuts are not simple cuts like those made by a knife; they are horrible wounds and cause shredded flesh. Chain saws can quickly remove muscles, tendons, and bone.</p> <p>DISPLAY NEXT SLIDE</p>



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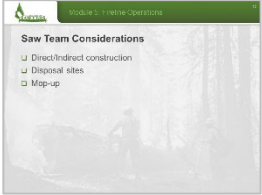
Slide/action	Content
<p data-bbox="224 369 451 457"><i>Slide 83: Sawyer and Swamper Team Responsibilities</i></p>  <p data-bbox="224 1224 451 1276"><i>Slide 94: Cutting Area Control</i></p> 	<h3 data-bbox="500 369 1117 401">Sawyer and Swamper Team Responsibilities</h3> <p data-bbox="500 432 565 464">Say:</p> <p data-bbox="500 489 1398 552">When working as a member of a saw team, keep your responsibilities in mind.</p> <ul data-bbox="529 590 1409 1115" style="list-style-type: none">▪ The sawyer and the swamper must discuss the objective and develop a plan for working together.▪ The saw team must maintain awareness of the location and proximity of each other and other resources.▪ The sawyer must communicate when it is clear for the swamper to remove the cut material.▪ Because of the noise, the sawyer and swamper(s) should establish nonverbal signals to ensure positive communications.▪ Swampers often provide a communication link between the saw team and other resources.▪ The sawyer and swamper must determine what a manageable size is for all cut material.▪ Swampers should not drive wedges during felling operations. <p data-bbox="500 1129 716 1161">Display Next Slide</p> <h3 data-bbox="500 1224 841 1255">Cutting Area Control</h3> <p data-bbox="500 1287 565 1318">Say:</p> <p data-bbox="500 1350 1414 1455">The cutting area is the immediate area around saw operations that the saw team must control to prevent injuries to those not directly involved with the activity.</p> <p data-bbox="500 1486 1390 1623">Most fireline operations involve many firefighters. When operating a chain saw on a wildland incident, cutting area control is a shared responsibility and must be a priority for each member of the saw team.</p> <p data-bbox="500 1661 708 1692">DISPLAY NEXT SLIDE</p>

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Slide/action	Content
<p><i>Slide 105: Cutting Area Control Considerations</i></p> 	<h3>Cutting Area Control Considerations</h3> <p>Say:</p> <p>Some considerations include:</p> <ul style="list-style-type: none">▪ Communication and coordination with other resources▪ Bucking in steep terrain (potential for rolling materials)▪ Felling operations: ensure that you can maintain control of the area and that all others stay away a minimum of 2½ times the height of the tree being felled <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 116: Fireline Saw Team Tasks and Tactics</i></p> 	<h3>Fireline Saw Team Tasks and Tactics</h3> <p>Say:</p> <p>The goal of fireline construction is to minimize fire intensity and slow the spread of the fire. Fire personnel typically complete fireline construction according to fireline construction specifications. Fireline sawing tasks and tactics vary depending on many factors on a wildland fire incident.</p> <p>The saw team's role in fireline construction normally involves clearing vegetative material to make way for handtools and fireline construction as well as identifying hazard trees that pose a risk to firefighter safety. It is important for the saw team to have a good understanding of these factors when determining what tasks and tactics to use.</p> <p>DISPLAY NEXT SLIDE</p>

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Slide/action	Content
<p data-bbox="224 369 451 426"><i>Slide 127: Saw Team Considerations</i></p> 	<p data-bbox="500 369 862 405">Saw Team Considerations</p> <p data-bbox="500 432 1393 499">The tasks that the saw team will undertake to remove vegetation are based on many factors.</p> <p data-bbox="500 527 781 562">Some factors include:</p> <ul data-bbox="548 590 873 751" style="list-style-type: none">▪ Fire behavior▪ Fuel type▪ Fuel loading▪ Fireline specifications <p data-bbox="500 764 1049 800">Some examples of the saw team tasks are:</p> <ul data-bbox="529 827 1032 947" style="list-style-type: none">▪ Direct/indirect fireline construction▪ Disposal sites▪ Conduct mop-up operations <p data-bbox="500 968 667 1003">Transition:</p> <p data-bbox="500 1031 1393 1098">The goal of fireline construction is to minimize fire intensity and slow the spread of the fire.</p> <p data-bbox="500 1129 716 1165">Display Next Slide</p>

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Slide/action	Content
<p data-bbox="224 369 451 428"><i>Slide 138: Saw Team Tactics: Progressive</i></p> 	<p data-bbox="500 369 938 403">Saw Team Tactics: Progressive</p> <p data-bbox="500 432 565 466">Say:</p> <p data-bbox="500 491 1414 793">Each saw team cuts a swath of fireline, with the lead team only cutting enough fuel to pioneer the fireline. The following teams complete the fireline to specifications. The lead team will work the side of the line farthest from the edge of the fire based on fireline specifications and incident management personnel may task them with cutting keyholes to place cut material. During progressive construction, each saw team will work a swath closer to the fire's edge until they reach the line specification.</p> <p data-bbox="500 823 1406 1012">After the saw teams have completed the fireline to specifications, firefighters will follow behind and begin constructing a handline down to mineral soil. It is important to ensure there is good communication and proper spacing between the saw teams and the firefighters constructing the handline.</p> <p data-bbox="500 1041 1349 1188">The progressive technique is often used when working in heavy, continuous fuels. The goal should be to keep steady forward movement with equal spacing, allowing for adjustments based on fuels being removed.</p> <p data-bbox="500 1209 711 1243">DISPLAY NEXT SLIDE</p>



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<p data-bbox="224 384 451 447"><i>Slide 19: Saw Team Tactics: Leapfrogging</i></p> 	<h3 data-bbox="500 363 963 405">Saw Team Tactics: Leapfrogging</h3> <p data-bbox="500 426 565 468">Say:</p> <p data-bbox="500 489 1414 751">Fireline sawyers often use the "leapfrog" technique in lighter fuels or when fire behavior is relatively low. The first saw team starts cutting the entire section of fireline to specifications. The second team walks a predetermined distance ahead of the first team, identifies a good starting location and starts cutting fireline to specifications. Good communication between the saw teams is important when using the leapfrog technique.</p> <p data-bbox="500 783 1401 930">This technique is not advised when there is potential for fire to cut off escape routes, preventing retreat to safety zones. If there is active fire behavior, it is best to take shorter leaps to ensure hotter parts of the fire edge become secured.</p> <p data-bbox="500 961 1398 1035">When the first saw team reaches the location where the second saw team started, they will leap ahead of them to a new starting location.</p> <p data-bbox="500 1056 711 1087">DISPLAY NEXT SLIDE</p>
<p data-bbox="215 1161 459 1192"><i>Slide 20: Disposal Sites</i></p> 	<h3 data-bbox="500 1144 695 1186">Disposal Sites</h3> <p data-bbox="500 1207 565 1249">Say:</p> <p data-bbox="500 1270 1409 1606">Sawyers also create disposal sites for cut material. The decision on the type and location of the disposal site depends on the type and density of vegetation the sawyer is cutting, topography, and number of swampers. Disposal sites include natural openings known as windows as well as constructed openings known as keyholes. Swampers can also bank or stack material on the green side of the fireline or simply throw or drag cut material out of the way. It is important to allow access points to the green side of the fireline in case a spot fire or rollout occurs.</p> <p data-bbox="500 1638 727 1669">DISPLAY NEXT SLIDE</p>

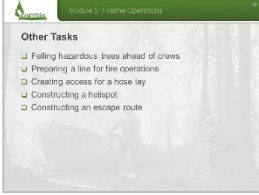
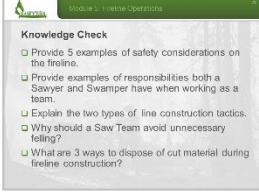
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Slide/action	Content
<p data-bbox="232 384 443 474"><i>Slide 21: Saw Team Tactics: Material Removal</i></p> 	<h3 data-bbox="500 369 1109 405">Saw Team Tactics: Material Removal</h3> <p data-bbox="500 432 565 468">Say:</p> <p data-bbox="500 489 1287 525">Let's review some common tactics for removing cut material.</p> <ul data-bbox="529 552 1409 783" style="list-style-type: none">▪ Banking—Stacking cut material on the side of the fireline opposite the fire edge.▪ Chaining—Removing cut fuels by handing material from one person to the next person in a line.▪ Throwing—Removing cut fuels by throwing them away from the fireline. <p data-bbox="500 810 711 846">DISPLAY NEXT SLIDE</p>
<p data-bbox="232 898 443 957"><i>Slide 142: Mop-up Operations</i></p> 	<h3 data-bbox="500 898 768 934">Mop-up Operations</h3> <p data-bbox="500 961 565 997">Say:</p> <p data-bbox="500 1018 1377 1207">During mop-up operations, the saw team's responsibilities include identifying aerial hazards and facilitating access for handtools, hose lays, etc. Saw teams can assist firefighters during mop-up by cutting burning logs, cutting material to pile, limbing and bucking downed trees, and flush cutting stumps.</p> <p data-bbox="500 1234 1401 1381">There may be situations when removing a hazard may put the sawyer at more of a risk than simply avoiding the hazard. The saw team should flag off and communicate to others any hazards which cannot be mitigated.</p> <p data-bbox="500 1409 711 1444">DISPLAY NEXT SLIDE</p>

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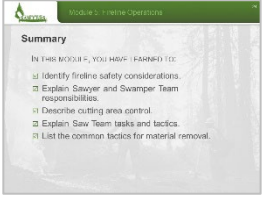

Slide/action	Content
<p data-bbox="215 369 459 394"><i>Slide 153: Other Tasks</i></p> 	<h3 data-bbox="496 369 667 401">Other Tasks</h3> <p data-bbox="496 432 561 464">Say:</p> <p data-bbox="496 495 1195 527">You may be asked to also execute the following tasks:</p> <ul data-bbox="529 558 1081 768" style="list-style-type: none">▪ Felling hazardous trees ahead of crews▪ Preparing a line for firing operations▪ Creating access for a hose lay▪ Constructing a helispot▪ Constructing an escape route <p data-bbox="496 779 708 810">DISPLAY NEXT SLIDE</p>
<p data-bbox="215 852 459 905"><i>Slide 164: Knowledge Check</i></p> 	<h3 data-bbox="496 852 789 884">Knowledge Check</h3> <p data-bbox="496 915 1398 1020">Give students a few moments to answer the questions in the student guide. Discuss the answers, emphasizing the correct ones and correcting any misunderstandings.</p> <p data-bbox="496 1041 1333 1073">Q: Provide five examples of safety considerations on the fireline.</p> <p data-bbox="496 1104 846 1136">A: Answers should include:</p> <ul data-bbox="529 1167 1000 1587" style="list-style-type: none">▪ Increased operational tempo▪ Fatigue▪ Other saw teams and equipment▪ Rolling material▪ Stump holes▪ Fire weakened trees▪ Fire behavior▪ Aerial hazards▪ Darkness▪ Smoke <p data-bbox="496 1608 1398 1682">Q: Provide examples of responsibilities both a sawyer and a swamper have when working as a team.</p> <p data-bbox="496 1713 846 1745">A: Answers should include:</p> <ul data-bbox="529 1776 1073 1808" style="list-style-type: none">▪ Be aware of and avoid the strike zone.

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Slide/action	Content
	<ul style="list-style-type: none">▪ Be responsible for each other’s safety and for those around them.▪ Have good communication on the objective of the operation and about when it is clear to remove cut material.▪ Be responsible for establishing and maintaining cutting area control. <p>Q: Explain the two types of line construction tactics.</p> <p>A: Answers should include:</p> <ul style="list-style-type: none">▪ Progressive<ul style="list-style-type: none">• Each saw team cuts a swath of fireline, with the lead team only cutting enough fuel to pioneer the fireline, and the following saw teams complete the fireline to specifications.▪ Leapfrogging<ul style="list-style-type: none">• The first saw team starts cutting the entire section of fireline to specifications. The second team walks a predetermined distance ahead of the first team, identifies a good starting location and also starts cutting fireline to specifications. <p>Q: Why should a saw team avoid unnecessary felling?</p> <p>A: There may be situations when removing a hazard or felling trees that may put the sawyer at a greater risk of injury than simply avoiding the hazard.</p> <p>Q: What are three ways to dispose of cut material during fireline construction?</p> <p>A: Answers could include:</p> <ul style="list-style-type: none">▪ Window▪ Keyhole▪ Banking▪ Chaining▪ Throwing <p>DISPLAY NEXT SLIDE</p>

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Slide/action	Content
<p><i>Slide 25: Summary</i></p>  A screenshot of a presentation slide titled "Summary" with a green header. The slide content includes the text "IN THIS MODULE, YOU HAVE LEARNED TO:" followed by a bulleted list: "Identify fireline safety considerations," "Explain Sawyer and Swamper Team responsibilities," "Describe cutting area control," "Explain Saw Team tasks and tactics," and "List the common tactics for material removal."	<h3>Summary</h3> <p>Say:</p> <p>In this module you learned to identify fireline safety considerations, explain sawyer and swamper team responsibilities, describe cutting area control, explain saw team tasks and tactics, and list common tactics for material removal.</p> <p>DISPLAY NEXT SLIDE</p>
<p><i>Slide 176: Questions</i></p>  A screenshot of a presentation slide with a dark, moody forest background. The word "QUESTIONS?" is written in white, all-caps text in the center of the slide.	<h3>Questions</h3> <p>Ask</p> <p>Are there any questions about fireline operations?</p>

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