

# USDA Forest Service National Sawyer Training: Developing Thinking Sawyers



## Student Guide: Classroom

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

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## Module 5: Fireline Operations

### Introduction

This module is an introduction to wildland fire chain saw operations.

### Module Topics

The topics in this module are:

- Fireline safety
- The sawyer and swamper team
- Cutting area control
- Saw team tasks and tactics
- Saw team tactics: material removal

### Objectives

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

- Identify fireline safety considerations.
- Explain sawyer and swamper team responsibilities.
- Describe cutting area control.
- Explain saw team tasks and tactics.
- List the common tactics for material removal.

### Fireline Safety

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.

### Fireline Safety Considerations

Things to consider include:

- **Follow** the principles of LCES—lookout(s), communication(s), escape route(s), and safety zone(s); and the 10 standard fire orders.
- **Be aware** of the 18 watch out situations.
- **Maintain** communication and coordination with other saw teams, crew members, and other resources (heavy equipment, fixed-wing retardant drops, helicopter bucket drops, etc.).
- **Never fell trees** when conditions such as darkness or smoke make observing the top of the tree or the intended lay difficult.

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- **Establish** a safe operational tempo for existing conditions.
  - **Example:** When sawing at night, slow your operational tempo. Take extra precautions as recognizing hazards becomes more challenging.
- **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.

**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.

**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.

**What is a Fuel Geysers?**

A **fuel geysers** is the forceful expulsion of liquid and vapor fuel from the fuel tank caused by the rapid depressurization of the tank (figure 5.0.1). 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. Fuel geysers have resulted in injury when sprayed fuel and vapor have ignited.

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**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 geyser 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.



**Figure 5.0.1—A fuel geyser warning poster.**

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.

**Fireline Personal Protective Equipment (PPE)**

Sawyers and swamper must wear all required personal protective equipment (PPE) for fireline operations.

**Table 5.0.1—Fireline personal protective equipment (PPE) requirements (NFPA = National Fire Protection Association, ANSI = American National Standards Institute)**

PPE	Chain saw operations	Crosscut saw operations
<b>Head protection</b>	Helmet meeting NFPA 1977	Same as chain saw
<b>Eye protection</b>	ANSI Z87.1 safety glasses or equivalent (mesh bug-eye type)	Same as chain saw
<b>Hearing protection</b>	Hearing protection required for gasoline-powered chain saw use	None required
<b>Hand protection</b>	Leather gloves	Same as chain saw

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<b>PPE</b>	<b>Chain saw operations</b>	<b>Crosscut saw operations</b>
<b>Shirt</b>	Flame-resistant, long-sleeved shirt	Same as chain saw
<b>Pants</b>	Flame-resistant, long pants	Same as chain saw
<b>Leg protection</b>	Chaps meeting the requirements of Forest Service Specification 6170-4; chaps overlap boots at least 2 inches	None required
<b>Boots</b>	Cut-resistant or leather, laced, 8-inch-high boots that provide ankle support and nonskid soles	Same as chain saw

### The Sawyer and Swamper Team

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.

### Sawyer and Swamper Team Cohesion

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.

The sawyer and the swamper have a shared responsibility for each other's safety, as well as that of other firefighters in the area. A well thought out approach will not only help with the removal of cut material but will also allow the saw team to establish a rhythm while maintaining cutting area control. This is a situation where both the sawyer and swamper should be operating from the front of their brains and be in a team mindset.



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**Figure 5.0.2—Chain saw cuts.**

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.

### Sawyer and Swamper Team Responsibilities

When working as a member of a saw team, keep your responsibilities in mind.

- 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 communication.
- **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.

### Cutting Area Control

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.

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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.

#### Cutting Area Control Considerations

Some considerations include:

- **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

#### Fireline Saw Team Tasks and Tactics

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 at a wildland fire incident.

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.

#### Saw Team Considerations

The tasks that the saw team will undertake to remove vegetation are based on many factors.

Some factors include:

- Fire behavior
- Fuel type
- Fuel loading
- Fireline specifications

Some examples of the saw team tasks are:

- Direct/indirect fireline construction
- Disposal sites
- Conduct mop-up operations

#### *Direct and Indirect Construction*

Typically, sawyers only need to cut enough vegetation to slow the spread of the fire. Doing so lessens the amount of energy the sawyer and the swamper must exert and increases fireline production rates.

Often, simply limbing larger trees is sufficient and produces much less material that the saw team must move. Sawyers should cut material into manageable pieces to facilitate removal.

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#### Saw Team Tactics: Progressive

Fireline construction can be direct or indirect. When fire crews use multiple saw teams, there are different tactics that they can employ.

#### *Animation*

Watch the animation and then discuss it with your instructor and the class.

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.

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.

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.

#### Saw Team Tactics: Leapfrogging

#### *Animation*

Watch the animation and then discuss it with your instructor and the class.

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.

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.

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.

#### Disposal Sites

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

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way. It is important to allow **access points** to the green side of the fireline in case a spot fire or rollout occurs.

## Saw Team Tactics: Material Removal

Below are some common tactics for removing cut material.

- **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.

## Mop-up Operations

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.

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.

## Other Tasks

You may be asked to also execute the following tasks:

- 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

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**Knowledge Check**

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

Provide five examples of safety considerations on the fireline.

Provide examples of responsibilities both a sawyer and a swamper have when working as a team.

Explain the two types of line construction tactics.

Why should a saw team avoid unnecessary felling?

What are three ways to dispose of cut material during fireline construction?

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## Summary

In this module, you have learned to:

- Identify fireline safety considerations.
- Explain sawyer and swamper team responsibilities.
- Describe cutting area control.
- Explain saw team tasks and tactics.
- List the common tactics for material removal.

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