USDA Forest Service
National Sawyer Training:
Developing Thinking Sawyers

FIRELINE OPERATIONS
MODULE 5

Instructors Guide
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Module 5: Fireline Operations

Welcome and Introduction

Time: 73 minutes

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.

Slide 1: Fireline Operations

Introduction

Say:

Welcome to Module 5 of the “Developing Thinking Sawyers” course. This module is an introduction to wildland fire chain saw operations.

Slide 2: Module Topics

Module Topics

Review the module topics listed on the slide.

Transition:

Let’s review the objectives we have for this module.

Slide 3: Objectives

Objectives

Review the objectives listed on the slide.
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.
- **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.
### Fireline Safety Considerations

**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**
What is a Fuel Geyser?

Say:

A fuel geyser 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 geyser 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 geyser.
- 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.

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.
### Slide 8: Video: Fuel Geysering Examples

**Say:**

Now, we will watch a video showing two examples of a fuel geyser in a lab-controlled scenario.

After the video, ask the class if they have questions and provide them with answers. **Note:**

The content of this video is covered in the student guide under the heading “What is a Fuel Geyser?”

### Slide 9: Fireline Personal Protective Equipment (PPE)

**Say:**

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

**INSTRUCTOR NOTE**

Read through the fireline PPE required below:

- **Head protection**
  - Chain saw: helmet meeting National Fire Protection Association (NFPA) 1977
  - Crosscut saw: same as chain saw

- **Eye protection**
  - Chain saw: American National Standards Institute (ANSI) Z87.1 safety glasses or equivalent (mesh bug-eye type)
  - Crosscut saw: same as chain saw

- **Hearing protection**
  - Chain saw: hearing protection required for gasoline-powered chain saw use
  - Crosscut saw: none required

- **Hand protection**
  - Chain saw: leather gloves
  - Crosscut saw: same as chain saw

- **Shirt**
  - Chain saw: flame-resistant, long-sleeved shirt
## Crosscut saw: same as chain saw

### Pants

- Chain saw: flame-resistant, long pants
- Crosscut saw: same as chain saw

### Leg protection

- Chain saw: chaps meeting the requirements of Forest Service Specification 6170-4; chaps overlap boots at least 2 inches
- Crosscut saw: none required

### Boots

- Chain saw: cut-resistant or leather, laced, 8-inch-high boots that provide ankle support and nonskid soles
- Crosscut saw: same as chain saw

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### The Sawyer and Swamper Team

**Say:**

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.
Slide 11: Sawyer and Swamper Team Cohesion

Sawyer and Swamper Team Cohesion

Say:

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.

Slide 72: Chainsaw Cuts

Chainsaw Cuts

Say:

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

Say:

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 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.

Display Next Slide

Cutting Area Control

Say:

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.

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.

Display Next Slide
# Cutting Area Control Considerations

**Say:**

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.

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# Fireline Saw Team Tasks and Tactics

**Say:**

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.

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

Transition:

The goal of fireline construction is to minimize fire intensity and slow the spread of the fire.

Display Next Slide
Saw Team Tactics: Progressive

Say:

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

**Say:**

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.

**DISPLAY NEXT SLIDE**

### Disposal Sites

**Say:**

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.

**DISPLAY NEXT SLIDE**
Saw Team Tactics: Material Removal

Say:
Let’s review 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

Say:
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

Say:

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

Knowledge Check

Give students a few moments to answer the questions in the student guide. Discuss the answers, emphasizing the correct ones and correcting any misunderstandings.

Q: Provide five examples of safety considerations on the fireline.

A: Answers should include:

- Increased operational tempo
- Fatigue
- Other saw teams and equipment
- Rolling material
- Stump holes
- Fire weakened trees
- Fire behavior
- Aerial hazards
- Darkness
- Smoke

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

A: Answers should include:

- Be aware of and avoid the **strike zone**.
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.

Q: Explain the two types of line construction tactics.

A: Answers should include:

- Progressive
  - 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
  - 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.

Q: Why should a saw team avoid unnecessary felling?

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.

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

A: Answers could include:

- Window
- Keyhole
- Banking
- Chaining
- Throwing
Summary
Say:
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.

DISPLAY NEXT SLIDE

Questions
Ask
Are there any questions about fireline operations?
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