Module 6: Hand Tools

Topic 1: Introduction

Hand tools introduction

Narration Script: Wildland fire fighting comes with a hefty toolbox. But don't let the weight of the toolbox or the terms you'll learn in this module wear you down. These topics are mostly about choosing the right tool for the right job—and how to take care of those tools so they return the favor. This module introduces you to the basic tools all wildland firefighters need to be familiar with. From cutters to scrapers, you'll learn the ropes not only on the "how to's" and the "where's and when's" of tool use. You'll learn how to properly sharpen, maintain, and store these hand tools as well. Let's get started working our way down the long list of hand tools.

Hand tools module overview

This module introduces you to the basic tools all wildland firefighters need to be familiar with.

We run down the concepts of:

- **Carrying hand tools**
- **Using hand tools**
- **Cutting tools**
- **Scraping tools**
- **Hand tool care**
- **Hand tool storage**

So, sit back, take a deep breath, and get prepared to learn and then let your knowledge shine.

Narration Script: Though you might be new to wildland fire fighting, you can still strut your knowledge stuff out on the fireline by knowing your hand tools. Knowledge will keep you on the cutting edge of fire fighting and, more important, keep you safe.

Topic 2: Cutting and Scraping Tools

Introduction

Hand tools play a major role in *controlling wildland fires*. **A hand tool's effectiveness is directly related to your knowledge of how, when, and where to safely use it and the care you give it. Even the finest tool won't get the job done if it's wrongly used or poorly maintained.**

This topic will describe the basics of the wildland firefighter's "tool box" including:

- **Tool safety**
- **Cutting tools**
- **Scraping tools**
- *Fire swatters*
- **Tool care and maintenance**

Narration Script: Wildland fires are often inconveniently located in rough terrain away from access routes. When the call comes to manage a fire, it's typically the wildland fire fighting crew who arrives first to the incident. You'll be carrying one of the most effective offensive and defensive weapons in fire management: the hand tool. As you'll discover in this topic, it takes more than brute strength to build fireline with a hand tool. From safety to storage, this topic paints the whole picture on the finer "points" of tool use. Trust us; it will sharpen your thinking.

Hand tools overview

Some wildland hand tools are conventional, and some are adaptations of conventional tools. Others, however, have been specially developed for fighting fires in wildland *fuels*.

You and your *crew* **boss will select hand tools based on where you are going to use them and on local preference. For example, you will use scraping or smothering tools primarily when fighting grass fires and cutting tools when fighting** *brush* **fires.**

Narration Script: Whether conventional or adaptations, your hand tools are designed to fit a variety of wildland fire fighting situations, and keep you looking smart on the fireline. But keeping your tools from turning into dangerous weapons means using them—as well as carrying and passing them—carefully. Therefore, safety is next on the agenda.

Safety in carrying hand tools

Hand tools can help you in many ways. But, if used improperly, they can hurt you! It starts with some elementary steps you may take for granted. Investigate the proper technique for carrying hand tools.

For safety while ***carrying*** **hand tools:**

- **Do not run with hand tools**
- **Walk and work 10 feet (3 m) apart from other firefighters**

- **Hold the tool at its balance point**
- **Keep the tool at your side and close to your body, not on your shoulder**
- **Position the cutting edges away from your body**
- **Situate the tool on the downhill side when walking across a** *slope*
- **Pass other workers by signaling and waiting for the right of way**
- **Transfer the tool handle first when passing the tool to others**

Narration Script: Improper methods of carrying hand tools can have disastrous results. Always carry your tools in a safe manner by following some simple procedures. Never run with a hand tool. Walk and work 10 feet apart. Hold your tool at its balance point. Hold it at your side and close to your body. Don't hold it at your shoulder. Keep the head of the tool forward with the cutting edge pointing away from your body or toward the ground. When you're walking across a slope, carry your tool on the downside. When you pass other workers, signal "coming through" and wait to be given the right of way. And when you pass the tool to another person, pass it handle first.

Safety in using hand tools

Now you have graduated to the proper techniques for using a hand tool!

For safety while *using* hand tools:

- **Keep your eyes on what is being cut**
- **Wear safety glasses at all times**
- **Use the proper grip and stance**
- **Use short strokes**
- **Watch your cutting angle and path of the tool head**
- **Store tools safely when not in use**

Narration Script: If you can carry your hand tools properly, then you should be able to use them properly! Always follow these procedures. Keep your eyes on what you're cutting so that the blade hits only what you want it to hit, and wear safety glasses at all times. And use the proper grip and stance. For cutting tools, such as brush hooks, Pulaskis, or axes, this means standing with your feet spread comfortably apart, having your feet parallel and your toes pointing at the item you intend to cut. Then, grab the butt of the handle with one hand, palm down. And grasp the handle near the tool head with your other hand, palm up. Then raise the tool overhead, but do not break the imaginary vertical plane extending through your shoulders. Then drive the tool head forcefully down while you slide one hand toward the other while maintaining a loose grip on the handle.

Whenever possible, use short strokes when cutting. When throwing dirt, proper grip and stance mean having stable footing, proper body position, and using a sweeping motion. When using a shovel for scraping, use your leg as a leverage point for efficiency. And to prevent ricochet, always be aware of your cutting angle and the path of the tool head. Watch for obstructions in its path that might deflect the blade into any part of your body or others around you. And don't chop toward your feet or other body parts. And store your tools safely when you're not using them.

Knowledge Check 1

Multiple choice—check the box of the answer(s) you choose.

Identify THREE correct procedures when using hand tools.

- ☐ **Walk and work 10 ft. (3 m) apart**
- ☐ **Hold tools at their balance point**
- ☐ **Carry hand tools on your shoulder for support**
- ☐ **Hold tools with the cutting edge toward your body**
- ☐ **Use short strokes when cutting**

The correct answers are walk and work 10 feet (3 m) apart, hold tools at their balance point, and use short strokes when cutting.

Cutting tools

We'll be covering three types of hand tools: cutting tools, scraping tools, and fire swatters. Let's start by taking a whack at cutting tools.

You will use cutting tools primarily for *fireline* **construction, including cutting brush and small trees. The most common hand cutting tools for wildland fire fighting are:**

- **Axes**
- **Pulaskis**
- *Brush hooks*
- *Sandviks*

You will investigate each of these cutting tools in turn.

Narration Script: Now that we've covered the hand tool safety points, let's cut to the chase and talk about cutting tools. You will use cutting tools primarily for fireline construction in heavier fuels like brush. And of course, while computer training is great, don't forget to get the field experience you need to become skilled with cutting tools!

Axes

Axes are effective in *mop-up* **operations for felling** *snags***, chopping stumps and logs, and driving wedges (single-bit axes only).**

Axe handles are made of wood or fiberglass. Two common types of axes used in wildland fire fighting are:

- **Single-bit—has a cutting edge on one side of the head and a flat, striking surface on the opposite side**
- **Double-bit—has cutting edges on both sides of the head**

Whether it's a single-bit or double-bit, swing the axe in a downward motion at a 45-degree angle. We'll talk more about how to use an axe when cutting fireline in the Suppression, Communication, and Mop-Up Module.

Caption: A single-bit axe (left) and a double-bit axe (right).

Sharpening axes

You are familiar with axes, but can you sharpen one?

Here are the steps to follow:

- **Sharpen the cutting edges with the proper tool, such as a 12-in. flat mill bastard file. Grind or file the edges on an even taper about 2 1/2 in. (65 mm) back from the cutting edge. Make sure you have an even bevel on each side.**
- **Ensure the cutting edge is in direct line with the handle.**

Pulaskis

Pulaskis are effective when cutting firelines and in mop-up operations.

These tools are dual-purpose tools with two different types of bits on the head:

- **One side is a cutting edge similar to an axe blade for chopping stumps and logs.**
- **The other edge, called the grubbing edge, is used to dig out roots and cut trenches.**

Narration Script: The Pulaski has what is called a "grubbing edge" for working below ground level. But don't be shy about using an axe or the axe blade of your Pulaski to cut roots that cross your control line. Roots are tough and may require many sturdy whacks from a sharp edge.

Caption: A typical Pulaski.

Sharpening Pulaskis

You might not be familiar with Pulaskis, or how to sharpen one. Again, it starts with the right sharpening tool, like the 12-in. flat mill bastard file.

Then, follow these steps:

- **Taper the cutting edge 2 in. (50 mm) wide with an even bevel on each side**
- **Bevel the grubbing edge 3/8 in. (10 mm) wide straight across on a 45-degree angle on one side of the head only**

Brush hooks

Use a brush hook, sometimes called a brush axe, to cut down:

- **Small shrubs**
- **Small trees**
- **Tall grasses**

The brush hook handle is very similar to a standard axe, and you'll swing it like an axe when you're cutting. However, unlike an axe, the head of the brush hook is in the shape of a *J*.

Caption: A typical brush hook.

Sharpening brush hooks

Now it's time to pick up your 12-in, flat mill bastard file and brush up on your brush hook sharpening skills.

A sharpened cutting edge is on the inside of the head. While there are a number of different designs available, sharpen all the cutting edges from 1 in. (25.4 mm) at the base to 3/4 in. (19 mm) at the tip.

Sandviks

Also called a *Swedish brush axe* because of its replaceable Swedish steel cutting blade, you can use the Sandvik to cut small- and medium-sized brush and saplings.

You'll experience less fatigue using the Sandvik because it weighs about half as much as a flathead axe. Less fatigue means increased safety and productivity.

Sharpen the blade to the manufacturer's specification, or replace the blade when it becomes dull. Inspect the Sandvik like you do for other tools.

Caption: A typical Sandvik.

Sharp tool advantages

The hand tools we've just covered should all have sharp cutting edges. After all, what's a cutting tool without a sharp edge?

All those sharp edges may make you a bit edgy. Cuts are always a possibility if you don't carry or use your tools properly.

However, a tool with a sharp blade benefits you because it:

- **Is easier and safer to use than a tool with a dull blade**
- **Cuts more effectively than a dull one**
- **Allows you to use short, sharp cutting strokes**
- **Reduces the need for you to raise a tool above your head**

All these benefits translate into less fatigue when you use the tool. And because fatigue is a leading contributor to fireline accidents, a sharp tool is a safer tool.

Narration Script: Make the proper use and maintenance of your hand tools a priority. If you keep your tools sharp, your job will be easier, and you'll be able to use short, efficient cutting strokes.

Knowledge Check 2

Matching—select the match you choose from the pull down list.

Ready to see if your cutting tool knowledge is a cut above the rest?

Match each cutting tool with the correct description.

Axe	Head is in the shape of a J
Pulaski	Head is in the shape of a J
Brush hook	Head is in the shape of a J
Sandvik	Head is in the shape of a J

The correct matches are as follows:
Axe: Consists of two types: single-bit and double-bit
Pulaski: Has a grubbing edge and a cutting edge
Brush hook: Head is in the shape of a J
Sandvik: Is very lightweight

Scraping tools

Most scraping tools are suited for fireline construction and mop-up operations. You can use them to:

- **Clear away small vegetation and debris to assist in making a fireline**
- **Sift through and break up small vegetation and debris**

The most common types of scraping tools for wildland fire fighting are:

- **Shovels**
- **McLeods**
- **Fire rakes**
- **Hoes**
- **Combination tools**
- **Wire brooms**

You will investigate each of these scraping tools in turn.

Narration Script: Now that you've learned about cutting tools, let's examine another type of hand tool—scraping tools. There are several scraping tools you can use to construct firelines or perform mop-up operations. Here are the most common ones. Study each one to see how to use and maintain it.

Shovels

Though very common and relatively simple, shovels have a wide variety of applications to wildland fire fighting, from attacking to mop-up operations.

Use shovels for:

- **Digging**
- **Scraping**
- **Smothering**
- **Beating (tamping)**
- **Cutting** *light fuels*
- **Throwing dirt**

Caption: A typical shovel.

Sharpening shovels

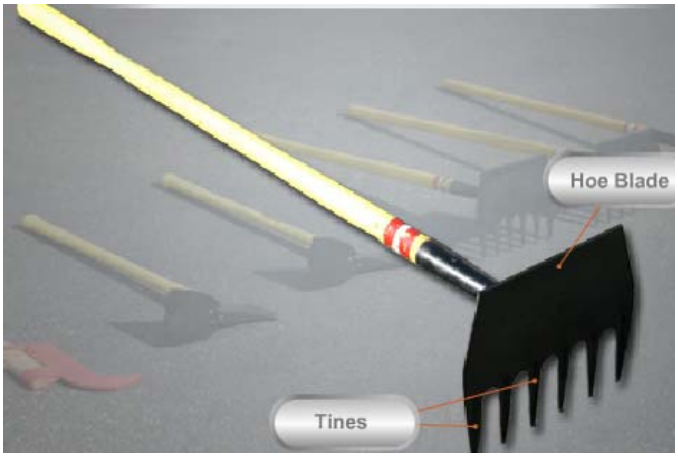
Sharpen the blade of a shovel starting 1.5 in. (38 mm) from the heel on each side of the blade until a subtle point is formed at the tip of the blade. Do the same number of strokes—and with the same amount of pressure—with a 12-in. flat bastard file on each side so that the shovel point does not drift from the center line.

McLeods

You'll use McLeods extensively in fireline construction and mop-up operations.

There are two sides to the McLeod:

- **Hoe blade—One side of the head consists of a solid hoe blade for cutting grass, deep litter, and light brush. You can also use the hoe portion for trenching and grubbing.**
- **Tines—One side of the head consists of a rake with five to seven long tines. The rake tines are effective in raking pine needles, duff, and leaf mold, or to dig into a burning log.**



Caption: A typical McLeod.

McLeod sharpening

The hoe blade portion of the McLeod should be beveled to 45-degree angle with the 12-in. flat bastard file on the outside face of the blade making sure the blade stays straight.

Fire rakes

Fire rakes resemble standard garden rakes except that the tines are broader and more triangular.

Sometimes referred to as *council rakes* or *council tools*, you'll use them in fireline construction, mop-up, and *burning-out* **operations in areas where you won't need the hoe function of a McLeod.**

You'll find the fire rake well suited to fireline construction in deciduous leaves. Sharpen the tines according to manufacturer's recommendations, or replace the tines.

Caption: A typical fire rake.

Hoes

One type of hoe you'll often use has a flat blade on one side of the head and may have two or three tines on the opposite side.

Your agency or organization may prefer another type of hoe, the *hazel hoe* (also called *adz hoe*) for wildland fire fighting operations because it is a heavy-duty tool that is well suited for grubbing through deep *duff* and use in rocky soil.

Use and maintain your hoe just like you would a McLeod tool.

Caption: An example of a hazel hoe.

Combination tools

A tool you may find very useful is the combination tool. It is a versatile long-handled implement with a two-part, multi-position head. With the release of the locking collar, you can change the configuration of the head and use the tool as:

- **Shovel**
- **Pick—do not use as a prying tool**
- **Hoe**
- **Various combinations of these modes**

Sharpen the shovel blade of your combination tool like you would a shovel. Sharpen the pick to 45 degrees using the 12-in. flat mill bastard file.

Narration Script: The combination—or "combi"—tool has both fans and detractors. It's a "jack of all trades, master of none" kind of thing. Many firefighters prefer the combi tool for its lightness and versatility. Others would rather work with sturdier shovels, picks, or hoes. You won't know until you've tried both!

Caption: A typical combi tool configured in this example as a hoe.

Wire brooms

Some wire brooms resemble push brooms; others resemble ordinary straw brooms with wire bristles.

The wire broom is a tool designed for use in the following types of fuels:

- **Leaf** *litter*
- **Grass**
- **Grain**
- **Moss**

You'll find the wire broom is especially effective in volcanic areas where light, sparse grasses protrude through a layer of small lava rocks. You can literally sweep away grasses to create an effective fireline.

Caption: A typical wire broom.

Fire swatter uses

Finally, now that you're an expert cutter and scraper, let's learn how to be an expert swatter.

You use fire swatters, sometimes called *flappers* or *flails,* to smother fires in light fuels such as:

- **Pasture grasses**
- **Pine-needle litter**
- **Light hardwood litter**

It's most effective to use a flail in conjunction with a backpack pump or fire rake. Use flails to *knock down* **the flames, and then mop up the fire with water from your backpack pump or by scraping it with the fire rake.**

Narration Script: Although you can use such things as wet spruce boughs to knock down flames, the tool used most often for smothering wildland fires is the fire swatter. For the best effect, use it with a backpack pump or fire rake.

Caption: An example of a fire swatter.

Fire swatter description and use

The fire swatter is a long-handled tool with a rubber or neoprene flap attached to one end. The flap is usually square with each side 16 to 24 in. (400 to 610 mm) in length.

When you use the fire swatter, drag the flap along the edge of a fire. Be careful not to hit the fire too hard or you may scatter burning embers into the unburned area and spread the fire.

You may replace the flap if it becomes damaged by heavy use.

Narration Script: In use, drag the flap along the edge of a fire. However, if the fire is hit too hard, burning embers may be scattered into the unburned area and spread the fire.

Knowledge Check 3

Matching—select the match you choose from the pull down list.

Let's scrape away all the fluff and get down to scraping tools!

Match each scraping tool with a specific and appropriate use.

Shovel	Constructing fireline in deciduous leaves
McLeod	Constructing fireline in deciduous leaves
Fire rake	Constructing fireline in deciduous leaves
Hoe	Constructing fireline in deciduous leaves
Wire broom	Constructing fireline in deciduous leaves

The correct matches are as follows:
Shovel : Throwing dirt
McLeod: Raking, trenching, and grubbing
Fire rake: Constructing fireline in deciduous leaves
Hoe: Grubbing through rocky soil
Wire broom: Sweeping away light grasses

Hand tool summary

Review the uses and characteristics of hand tools.

Narration Script: Whew! Your hands and back may be tired now. But before we continue, review the following table summarizing the uses and characteristics of hand tools. Everyone has a favorite tool. After a few hours on the fireline, you may find you prefer to be on the cutting edge with a Pulaski. Or you may favor the back-saving, longer-handled McLeod. Or chasing hot spots with 40 pounds of water on your back may be your thing. Whichever way you go—or if you trade off during your shift—keep all your tools in good condition and use them safely.

Tool Type	Characteristics	Capabilities	Sharpening/Maintenance Tips
Cutting tools			
Axes	Double or single bit	▪ Mop-up operations ▪ Felling snags ▪ Chopping stumps and logs ▪ Driving wedges	▪ Grind or file on an even taper approx. 2 1/2 in. (65 mm) back from cutting edge; maintain even bevel on each side ▪ Cutting edge should be in direct line with handle
Pulaskis	Cutting edge and grubbing edge	▪ Cutting firelines ▪ Mop-up operations	▪ Taper cutting edge 2 in. (50 mm) wide with even bevel on each side ▪ Bevel grubbing edge 3/8 in. (10-mm) wide straight across on 45° angle on one side of the head only
Brush hooks	J-shaped head	▪ Clearing small shrubs, small trees, and tall grasses	▪ Sharpen cutting edge from 1 in. (25.4 mm) at base to 3/4 in. (19 mm) at tip

Sandviks	Replaceable Swedish steel cutting blade	▪ Cutting small- and medium-sized brush and saplings	▪ Sharpen according to manufacturer's recommendations or replace blade
Scraping tools			
Shovels	Long-handled	▪ Digging, scraping, smothering, beating (tamping) ▪ Cutting light fuels ▪ Throwing dirt	▪ Sharpen starting 1 in. (25 mm) from heel on each side of blade until subtle point is formed at blade tip
McLeods	Solid hoe blade and rake with 5 to 7 long tines	▪ Cutting grass, deep litter, and light brush ▪ Trenching and grubbing ▪ Raking pine needles, duff, and leaf mold	▪ Bevel hoe blade to 45-degree angle on outside face of blade making sure the blade stays straight
Fire rakes	Tines are triangular in shape and broader than standard garden rakes	▪ Fireline construction in deciduous leaves ▪ Mop-up and burning-out operations	▪ Sharpen tines according to manufacturer's recommendations or replace ▪ Use and store properly
Hoes	Flat blade on one side and 2 or 3 tines on opposite side	▪ Grubbing through deep duff or rocky soil	▪ Use and maintain hoes like McLeod tools
Combination tools	Long-handled implement with two-part, multi-position head	▪ Shoveling ▪ Picking ▪ Hoeing	▪ Sharpen shovel blade like a regular shovel ▪ Sharpen pick on a 45degree angle
Wire brooms	Resemble push brooms or ordinary straw brooms with wire bristles	▪ Use in leaf litter, grass, grain, and moss fires	▪ Use and store properly
Fire swatters (flails)	Long-handled tool with flap attached to one end	▪ Smother fires in light fuels	▪ Replace flap if damaged by heavy use
Backpack pumps	Carries water or foam/water solution; may have rigid tank or collapsible bladder	▪ Attack small fires and hot spots ▪ Overhaul areas out of hoseline reach	▪ Rigid tanks may be stored either full of water or empty ▪ Collapsible bladders are usually stored empty

Hand tool care

If you use and maintain your hand tools properly, they will tend to remain in good shape. To this end, there are a few maintenance tips that will help ensure your hand tools last and perform properly.

Investigate these care and feeding tips for the handles and tool heads.

Handle Care and Maintenance

To prevent accidents and injuries:

- **Ensure handles are smooth, free of cracks or splinters, properly aligned, and securely attached to the tool head**
- **Sand wooden handles that are splintered; refinish with a light coating of linseed oil**
- **Replace loose or cracked handles to ensure the tool head does not break loose during use**

Tool Head Care and Maintenance

To prevent accidents and injuries:

- **Ensure tool heads are not broken or cracked**
- **Sharpen damaged or dull cutting edges using a hand file—this will actually reduce fatigue when you are using a tool**
- **Give all tool heads a light coating of oil, and keep them free of paint or rust**

When you are back at the station and using a grinder to sharpen a blade, be careful not to do it too fast. Grinding too fast will turn the steel blue and temper it, making file sharpening more difficult.

Narration Script: The principles of care and maintenance are generally similar for all of the hand tools that you have just learned about. Be sure to look at safety from both ends.

Hand tool storage

At some point after every call, it's time to stop using your tools and put them safely in storage.

Make sure your tools are easily accessible, protected from damage, and don't pose a hazard to anyone by following these tips:

- **Use guards for tools with sharp cutting edges or pointed heads**
- **Store all tools in their mounting brackets on the** *apparatus*
- **Arrange tools in an orderly manner when they are stored in compartments instead of mounting brackets**

Warning! Never ride with loose tools or equipment in the cab or crew compartment. Secure all tools in brackets, or store them in compartments.

Narration Script: Make sure your tools are stored properly after use. "Flying through the air with the greatest of ease" should refer to acrobats on the trapeze, not for tools in the cab of your vehicle! If there is a sudden stop or vehicle accident, you don't want sharp tools flying through the air.

Knowledge Check 4

Multiple choice—check the box of the answer(s) you choose.

Identify TWO ways to address splintering problems when using wooden-handled tools.

- ☐ **Use a hand file to smooth damaged handles**
- ☐ **Replace loose or cracked handles**
- ☐ **Ensure tool heads are not broken or cracked**
- ☐ **Use handle guards**
- ☐ **Sand and refinish handles with linseed oil**
- ☐ **Store tools in mounting brackets**

The correct answers are sand and refinish handles with linseed oil and replace loose or cracked handles.

Topic summary

The various cutting tools you have to use make your job more dangerous. Obviously, some tools are more dangerous than others, and when you use them (or work nearby others who are using them), you have an increased risk of injury. To avoid that possibility, remember to:

- **Check the condition of each tool and maintain it properly**
- **Know which tool is right for the job**
- **Carry and pass tools correctly**
- **Maintain proper spacing from your fellow firefighters**

Take these steps and your hand tools will be indispensable helpmates.

Narration Script: If you follow the basics we're covered in this topic, you'll be on the "cutting edge" of hand tool safety and use.