



S-130 Unit 8: Tools and Equipment

Summary:

This unit is intended to be taught as a hands-on presentation in the field, as a way to familiarize entry level fire personnel with the identification, description, function, and proper use of basic hand tools and equipment generally issued through the National Interagency Support Caches (NISC) System, and commonly used in wildland fire.

If field presentation is not possible, the unit can be taught via the PowerPoint in a classroom, utilizing the tools and equipment as reference.

Incident Position Description (IPD) Alignment:

This unit aligns with the following FFT2 IPD specific duties

(<https://www.nwcg.gov/positions/fft2/position-ipd>):

- Use standard firefighting tools such as pulaskis, shovels, McLeods, chainsaws, drip torches, and fuses.
- Ensure proper refurbishing and resupply of tools.
- Comply with all safety practices and procedures.

Unit Objectives:

- Describe and identify common hand tools.
- Describe the appropriate tool for a specific task based on fuel type and ground cover.
- Describe performing field maintenance, sharpening, and identifying tools which need to be put out of service and replaced.
- Demonstrate proper methods of carrying and passing tools.
- Demonstrate proper tool use, and appropriate spacing while using tools during suppression activities.
- Describe the proper placement of the tool while working in an area when the tool is not in use.

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Unit at a Glance:

Topics	Method	Duration
Cutting Tools	Field Presentation	15 Minutes
Scraping Tools	Field Presentation	15 Minutes
General Hand Tool Safety	Field Presentation	15 Minutes
General Sharpening Procedures	Field Presentation	5 Minutes
General Hand Tool Storage	Field Presentation	10 Minutes
Common Equipment	Field Presentation	10 Minutes
Alternative Tools	Field Presentation	10 Minutes
Specialty Tools	Field Presentation	5 Minutes
Total Unit Duration		1 Hour, 25 Minutes

Materials:

- Incident Response Pocket Guide (IRPG), PMS 461, <https://www.nwcg.gov/publications/461>.
- Water Handling Equipment Guide, PMS 447-1, <https://www.nwcg.gov/publications/447-1>.
- The tools and equipment presented in the unit, as well as local area specific tools and equipment
- Required fireline PPE
- Notebook for participants
- S-130 Student Evaluation Task Sheet
- Ability to display images and video on large screen (if field presentation not possible)
- White board or easel access for group breakout (if field presentation not possible)

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Note to Instructor

- This unit is intended to be taught as a hands-on presentation in the field.
- The tools and equipment referenced should be available as props for instructors and hands-on implements for students.
- If field presentation is not possible, the unit can be taught via the PowerPoint in a classroom, utilizing the tools and equipment as reference.

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Objectives

Students will be able to:

- Describe and identify common hand tools.
- Describe the appropriate tool for a specific task based on fuel type and ground cover.
- Describe performing field maintenance, sharpening, and identify tools which need to be put out of service and replaced.

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- Review unit objectives.

Slide 3

Objectives

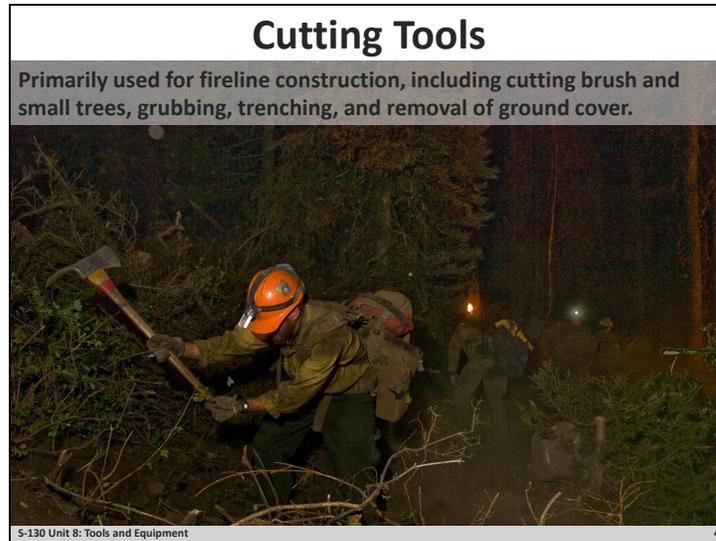
Students will be able to.

- Demonstrate proper methods of carrying and passing tools.
- Demonstrate proper tool use and appropriate spacing while using tools during suppression activities.
- Describe the proper placement of the tool while working in an area when tool is not in use.

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- Review unit objectives.

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- Discuss the nature of cutting tools and their purpose.
 - If well maintained, cutting tools should always have a sharp edge, and caution must be taken while in use.
 - Each tool, depending on the operator, can take many hours in the field to acquire proficiency.

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❑ Discuss terminology and parts:

- Head
- Cutting edge
- The eye
- Handle and handle material (wood or nupla)
- Shoulder and butt
- Metal and wood wedges

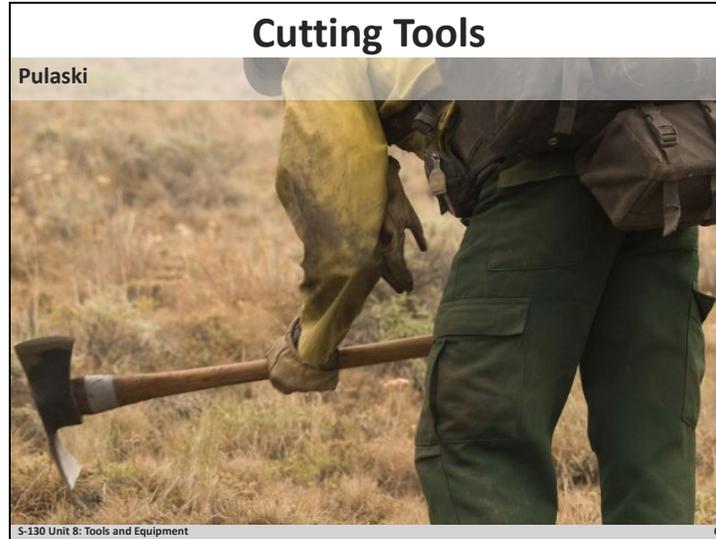
❑ Discuss tool use:

- Swing action should maintain a 45-degree angle
- Effective in mop-up for felling snags
- Hammerhead can be used breaking up stumps, logs, and other heavier materials
- Grip and stance

❑ Discuss sharpening:

- Technique
- Maintaining a minimum of 2 ½-inch taper on each side with an even bevel
- Sheath use

Slide 6



Discuss terminology and parts:

- Head
- Cutting edge
- Grubbing edge
- The eye
- Handle and handle material (wood or nupla)
- Shoulder and butt
- Metal and wood wedges

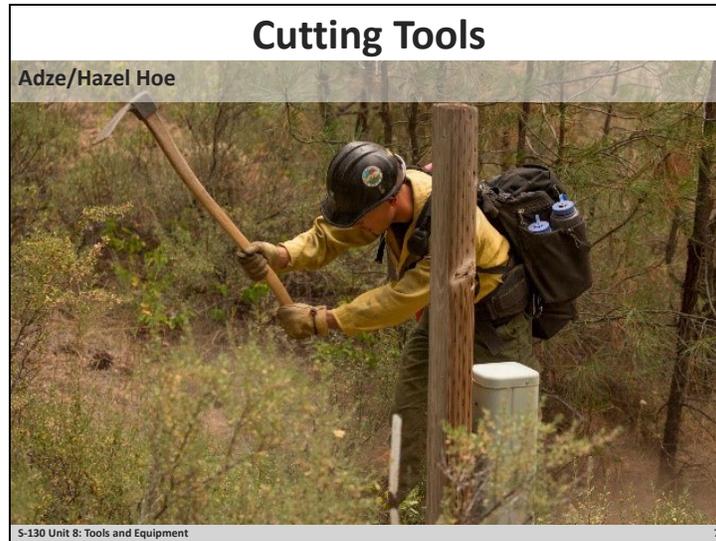
Discuss tool use:

- Cutting edge use is identical to that of a single bit ax
- Grubbing edge is used for digging roots, trenching, and marking
- Grip and stance

Discuss sharpening:

- Cutting edge should maintain a minimum of 2 ½-inch taper on each side with an even bevel
- Grubbing edge bevel needs to maintain a 45-degree angle and be 3/8 inch wide
- Sheath use

Slide 7



- Discuss terminology and parts:
 - Head
 - Grubbing edge
 - Eye
 - Handle
- Discuss tool use:
 - Cutting brush
 - Digging roots
 - Removing grass and other surface fuel
 - Trenching
 - Grip and stance
- Discuss sharpening:
 - Maintain a 3/8 inch-wide bevel with a 45-degree angle on the inside edge only

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- ❑ Discuss the process for inspecting any cutting tool. Cutting tools should be examined for the following:
 - Handle – look for cracks, deep gouges, and wear; inspect the condition of the wedge.
 - Head – damage to the cutting edge or head.
 - Cutting edges must be evaluated and kept sharp.
 - Look for and manage rust or rot.
 - Make sure tool has appropriate sheath or safety guards.
- ❑ Discuss the process if one of the above-mentioned items has an issue and what to do.
 - Take out of service and replace.
 - Repair and maintain where available, such as sanding the handle, sharpening the edges, replacing wedges.
- ❑ Discuss when inspections, maintenance, and repairs or replacements need to take place (every day, after each use, etc.).

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- ❑ Discuss how most scraping tools have a sharp edge and, like cutting tools, caution must be taken when using.
 - Some scraping tools come with a specific sheath or scabbard for that tool. On others, fiber tape or some other protective barrier must be applied when not in use.
 - Also like cutting tools, it will take time and practice to develop a proficient knowledge of how to use these tools safely and effectively while managing fatigue.

Slide 10



Discuss terminology and parts:

- Blade
- Cutting edge
- Handle
- Heel
- Handle rivets
- Shank
- Face
- Point

Discuss tool use:

- Digging
- Scraping
- Smothering
- Beating
- Cutting light fuels
- Throwing dirt
- Grip and stance

Discuss sharpening:

- Cutting edge should be maintained up to 1 ½ inches from the heel to the center point
- File motion is always towards the tip.
- When not in use always replace the sheath or fiber tape the sharp edge.

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- ❑ Discuss care and maintenance:
 - Examine the tool head for cracks, damaged cutting edge, and rust.
 - The tool handle should be smooth, aligned, and secure to the tool head.

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- ❑ Discuss terminology and parts:
 - Head
 - Cutting edge
 - Rake
 - Rivet
 - Shank
 - Handle
- ❑ Discuss tool use:
 - Scraping
 - Cutting
 - Grip and stance
- ❑ Discuss sharpening:
 - Maintain a straight and square 45-degree angle on the cutting edge.
 - The bevel needs to be maintained on the outside of the face.
 - When not in use always replace the sheath or fiber tape the sharp edge.
- ❑ Discuss care and maintenance:
 - Examine the tool head for cracks, damaged cutting edge, and rust.
 - The tool handle should be smooth, aligned, and secure to the tool head.

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Discuss terminology and parts:

- Head
- Pick/grub hoe
- Blade
- Hinge/hinge bolt
- Friction nut
- Rivet
- Shank
- Handle
- Cutting edge

Discuss tool use:

- Digging tool
- Scraping
- Smothering
- Cutting
- Picking in lighter fuels
- Working in between rock
- Functionality of the adjustable friction nut
- Grip and stance

Discuss sharpening:

- Sharpen both pick and blade at a 45-degree angle on the face of the blade

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- Tape sharp edges
- Discuss care and maintenance:
 - Inspect the tool head for cracks, damaged cutting edge, damaged pick, rust, hinge/hinge bolt function, and friction nut mobility.
 - Tool handle should be smooth, aligned, and secured to the head during inspection.

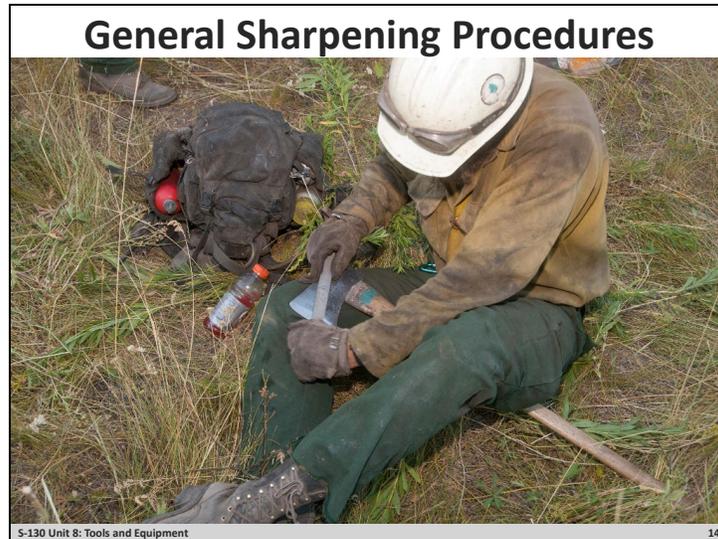
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- ❑ Discuss that any tool identified as damaged or unsafe should be flagged for non-use, taken out of service, and replaced.
- ❑ Discuss awareness about the hazards of working with hand tools both for the user and others that may be working around the user.
- ❑ Discuss the following information on mitigating hazards when working with and around hand tools used on the fireline:
 - Generally, 10-foot or three tool-length spacing from other crewmembers will prevent proximity injuries.
 - Be aware of any hazardous underbrush as well as aerial hazards in the canopy.
 - Know the proper carrying procedures by understanding the balance point. Position the tool on the downhill side, and always position the cutting edge away from the body.
 - Be diligent about inspecting the tools condition (head, edge, handle, secure attachment).
 - Keep eyes on what you are cutting.
 - Wear appropriate PPE at all times.
 - Be aware of cutting angle to prevent ricochet.
 - Verbally warn others when passing (“bumping by”), then wait until right of way is given before proceeding.
 - When handing a tool off to another, always pass the handle first and don’t release until the other person has shown control of it.
 - When the tool is not in use, lean it upright against an object out of the way or on the flat on the ground with guards on.

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Note to Instructor:

Demonstration of how to properly sharpen each tool should be provided, followed by participant opportunity for hands-on practice.

Discuss the following topics with participants:

- Gloves, long sleeve shirt, and eye protection should always be used when sharpening.
- A sharp tool is safer and more efficient. Users should make sure their tool is ready for use at all times including maintaining a sharp tool in the field.
- Secure the tool and make sure the work area around you is clear.
- Use the appropriate file size, which in most cases will be a 12 inch flat mill bastard, in good condition, with handle and guard. Worn files will slip and not bite. Use the full length of the file.
- Use palm of flat hand to apply pressure to file; don't use fingers or wrap them around the file.
- Do not check for sharpness with an ungloved finger; instead, use visual inspection to determine appropriate edge.
- Use the appropriate angle for each tool.

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- ❑ Discuss how to properly store a hand tool including taking into account the tool's condition before it is stored, the manner in which it is stored, and appropriate locations for storage.
- ❑ Discuss safety guards:
 - Boxes they were shipped in,
 - Old hose cut on one side to cover blades,
 - Masking tape/fiber tape,
 - Sheaths, or
 - Old inner tubes, etc.
 - Always attach them before tool is stored.
- ❑ Discuss storage in vehicles:
 - Make sure safety guards are put on or the edge is covered.
 - Place tool in pre-identified tool compartment.
 - If flying in a helicopter, make sure tool edges are covered and a manageable number of tools are secured together (i.e., group of 5 tools bundled with fiber tape).
- ❑ Discuss storage in close proximity to fireline.
 - Safe distance from fireline and personnel.
 - Visible to others (consider using flagging).
 - Cutting edges towards ground.
 - Safety guards, sheaths, or other edge protection in place.
- ❑ Have participants demonstrate where and how to place tools that are not in use.

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Knowledge Check

Name the tool identified in the photo and describe its main purpose.

Tool:

Combination Tool

Purpose:

Primarily a digging tool, but can be used for scraping, smothering, cutting, picking, building a roll trench, and working in between rocks.



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Question: Name the tool identified in the photo and describe its main purpose.

Answer: Combination Tool

Primarily a digging tool, but can be used for scraping, smothering, cutting, picking, building a roll trench, and working in between rocks.

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- ❑ Discuss that, like hand tools, some equipment is more specific to varying geographic areas and may not be common in your area. Instructors should take the time to identify equipment that is specific to the local unit but also expand on things they might use or see throughout the country.

Slide 18



- ❑ Discuss that firefighters must successfully complete S-212, Wildland Fire Chainsaws, prior to participating in chainsaw operations.
- ❑ Discuss common uses of chainsaws in wildland fire:
 - Felling
 - Limbing and bucking trees
 - Clearing brush
 - Constructing control line
 - Clearing hazards
 - Creating or improving safety zones and escape routes
 - Providing access to mop up areas
 - Stihl and Husqvarna are the most commonly brands. Provide examples of what brands and types are used on your local unit.

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- ❑ Discuss that, unlike chainsaws, operation of portable pumps does not require a course; however, S-211, Portable Pumps and Water Use, is required for some higher-level positions.
- ❑ Discuss examples used in your area such as:
 - Honda GXH50
 - Shindaiwa GP45
 - There are various others described and referenced in the *Water Handling Equipment Guide*, PMS 447-1, <https://www.nwcg.gov/publications/447-1>.
- ❑ Discuss the use of light duty pumps for initial attack fires, as they are not meant to support a robust hydraulic operation but can be extremely useful on small incidents where the water does not need to travel long distances or up steep slopes.
 - These pumps can be either two- or four-cycle engines.
 - Most weigh around 30 pounds.
 - Performance will vary depending on each pump but can range from 37 to 65 gallons per minute (gpm), at 50 pounds per square inch (PSI) of pressure.

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- ❑ Reference High Pressure Pump Information in the *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Focus discussion on the following high-pressure pump topics in the IRPG:
 - Weight
 - Fuel mix ratio and consumption rate
 - Performance at sea level (max psi)
- High pressure portable pumps are the most widely used portable pumps as they generate more pressure and flow compared to other portable pumps.
- They are used for initial attack, mopup, structure protection, and hose lays.
- ❑ Discuss examples used in your area:
 - Pacific Wildfire Mark III
 - Wick 375
- These pumps and their performance are referenced in the S-211, Portable Pumps and Water Use, as well as the *Water Handling Equipment Guide*, <https://www.nwcg.gov/publications/447-1>.

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- ❑ Discuss the Waterous Flo-to-pump, where it is used, and why.
 - More common in the Eastern, Southern, and Alaska geographic areas.
 - The key benefit to a floatable pump is its suitability to marshy areas where there is no firm ground to place a Mark III, or extremely steep and rocky slopes that border a body of water and is difficult to locate a flat platform to run any other kind of pump. They can also be used in irrigation ditches and portable tanks.
- ❑ Discuss pump specifications:
 - Unlike a standard pressure pump, floatable pumps have no suction hose.
 - Easily carried by one person.
 - Pump assembly includes engine, fuel tank, rope starter, pump, controls, fittings, floating collar, strainer, and other accessories.
 - Dry weight of 45 pounds
 - Operational weight, full of water, exceeds 60 pounds
 - Operates on a 2-cycle engine requiring gas/2-stroke oil mix
 - Performance ranges from 56 gpm @ 50 psi 150 gpm @ 20 psi, which lies between a lightweight pump and pressure pump.

Slide 22



- ❑ Discuss pump use on wildland fire:
 - Transferring large volumes of water under lower pressure
 - Filling portable water tanks, water tenders, and fire engines from streams, rivers, and lakes where it is not possible or efficient to draft.
- ❑ Discuss pump specifications:
 - Inlets and outlets of 3 inches
 - Flow capacity of 290 gallons per minute
 - The motor is a 4-cylinder gas engine, so mixing fuel is not needed
 - They centrifugal pump similar to the pressure pumps
 - Dry weight of 26 pounds
 - Most efficient if transferring water short distances over level ground

Slide 23

Knowledge Check

According to the IRPG, what is the mixed fuel ratio for high pressure pumps?

24:1



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Question: According to the IRPG, what is the mixed fuel ratio for high pressure pumps?

Answer: 24:1

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Slide 24



- Slides 25 - 32 cover alternative tools and specialty tools. If these tools are not available for the field, use the Power Point presentation to introduce them to students.
- Variations exist in tools due to specific needs in some geographic areas.
- The local area cache may have certain tools that are not available or commonly seen in other cache systems nationally.

Slide 25



- ❑ Discuss terminology and parts:
 - Handle
 - Shank
 - Tines
 - Screws or bolts
- ❑ Discuss tool use:
 - Scraping tool
 - Commonly used as a final sweep of the line and can be useful in and around rocky areas
 - Grip and stance
- ❑ Discuss sharpening:
 - This tool can be sharpened on both sides of each tine at a 45-degree angle from the base of the tine to the tip on the outside face
- ❑ Discuss care and maintenance:
 - Inspect tool head for missing or bent tines and safety guards are with the tool
 - The handle should be smooth, aligned, and secure to the head

Slide 26



Discuss terminology and parts:

- Handle
- Collar
- Shank
- Rivets
- Pad

Discuss tool use:

- In light flashy fuels with low fire intensity
- Making short flapping motions with the tool head or dragging on the ground to dampen and knock down flame
- Primarily used in the Southwest, Southern, Rocky Mountain, Eastern, and Alaskan geographic areas

Discuss care and maintenance:

- Inspect the handle condition
- Head
- Rubber pad for damage
- Inspect collar and shank for rust and fit to the handle
- Check for missing or damaged rivets holding the pad to the head
- There are different styles of swatter, but most are made of a rubber material and can be damaged by direct contact with flame or embers for too long.

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Discuss terminology and parts:

- Handle
- Tines
- Head
- Tine expansion lever

- Variations of this tool exist by size and functionality. Some handles telescope, and some have collapsible tines. With the shrub rake, often the handle is sawed off to a length that is capable of fitting in a line pack.

Discuss tool use:

- Scraping tool
- Commonly used as a final sweep of the line
- Removing small debris, litter, and needle cast
- Maintaining the mineral soil characteristic required for hand line integrity

- This tool has become increasingly common during handline construction operations.

Discuss care and maintenance:

- Requires limited pressure on the tines
- Checking for loose bolts and broken tines
- Inspect handle to insure functionality and lack of fractures

Slide 28



- Images from left to right: the Bonnie Slam Hammer by Dragonslayers, the Pick Hoe by Rogue, and the shombi (a custom tool with a shovel head and a combination tool handle).
- Discuss that in addition to tools issued to firefighters, there are many styles of specialty tools, provided by various vendors, that have similar functions as most of the originals but have either been modified or updated. Regardless of the tools source, all serve the same purpose regarding suppression activities.

Slide 29



- Images left to right: Troop Tool by Dragonslayers, super pulaski (custom), Rhino by J.R. Fire Tools

Note to Instructor:

If time allows, spend a couple of minutes discussing other hand tools not distributed by the NFES Cache system that you have used or have seen used and have different names but are considered a cutting, scraping, or smothering tool.

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- ❑ Discuss burlap as a tool:
 - Burlap sacks have been used as a fire smothering tool since the early 1900s.
 - Villagers still use burlap in parts of Alaska and so do smokejumpers who require lighter cargo.
 - Burlap can still be procured through the NFES cache system; however, the swatter/flapper is now the primary smothering tool.

- ❑ Discuss tool use:
 - Used by wetting it down with water and, like a flapper, smothering flames.
 - Once on the ground with burlap in hand, smokejumpers will often cover a spruce bough and use it in the same fashion as a swatter.

- ❑ Discuss care and maintenance:
 - Keep it moist while in use.
 - Don't allow the burlap to remain in contact with flame or embers for too long to prevent smoldering and burning.
 - Often wet peat or tundra can be stuffed into the burlap as a way to prolong moisture content and extend the tool's effectiveness.

Slide 31



- Tools can also be produced out of natural surroundings dependent of the geographic area. In Alaska, the spruce bough is an easy to come by tool used for smothering and flapping as a suppression technique. Firefighters will fashion a spruce bough tool out of a recently fallen tree, remove most of the lower limbs, and use the tip as a swatter.
- This is not a standalone suppression tool but can easily reduce fire effects to support access and functionality of direct attack suppression.
- If available, spruce boughs can be very successful slowing and reducing growth of spot fires, flare ups, and other threats to line integrity.

Slide 32

Objectives

Students will be able to:

- Describe and identify common hand tools.
- Describe the appropriate tool for a specific task based on fuel type and ground cover.
- Describe performing field maintenance, sharpening, and identify tools which need to be put out of service and replaced.

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- Review unit objectives.

Slide 33

Objectives

Students will be able to.

- Demonstrate proper methods of carrying and passing tools.
- Demonstrate proper tool use and appropriate spacing while using tools during suppression activities.
- Describe the proper placement of the tool while working in an area when tool is not in use.

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- Review unit objectives.