Chapter 5—Types of Axes and Related Tools

Single-Bit Axes

The European single-bit ax evolved into the American single-bit ax with the addition of the poll. By adding weight to the back of the ax head, the poll provided better balance and increased the striking force of the ax. The additional change from the long, narrow European cutting edge to the shorter, wider American cutting edge increased the accuracy and durability of the tool. The poll and wider cutting edge of the American single-bit ax (figure 5–1) increased its cutting efficiency and made it the new standard.

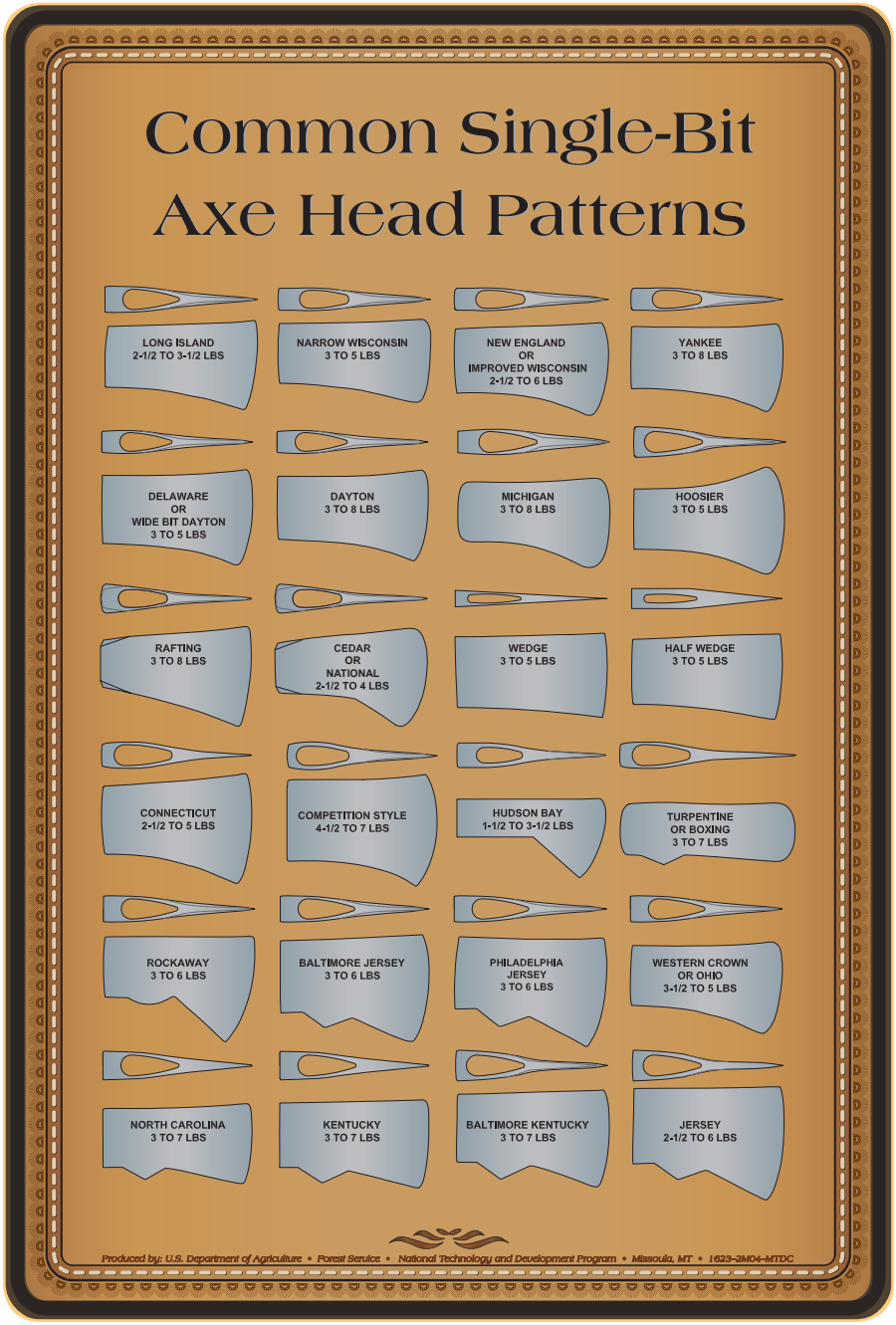
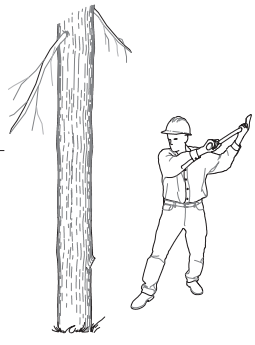


Figure 5–1—Common single-bit ax head patterns. Refer to "Appendix A—Full-Page Ax Illustrations" for a larger version of this illustration.



The poll also created a flat striking surface on the back side of the ax head, providing the user with a pounding or driving tool as well as a cutting tool. Keep in mind that, even today, the poll typically is not hardened steel and you should not use it to strike another piece of steel, such as a metal splitting wedge. Doing so will damage the poll (figure 5–2). Some modern axes may have hardened polls, but most vintage axes do not.

One exception is the rafting-pattern ax (figure 5–3). In the past, logs held together with steel cables and chains formed rafts that loggers floated downstream to the sawmill. The hardened poll on the back of a rafting-pattern ax allowed the loggers to drive metal fasteners to secure the cables and chains without damaging their axes.

Figure 5–2—A Winchester ax with a damaged poll.

Figure 5–3—Plumb 5-pound and 3½-pound rafting-pattern axes with elongated polls. The inset shows a rafting-pattern ax with a waffled poll.

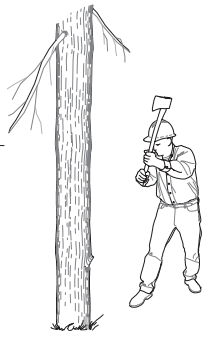
Splitting mauls and sledge hammers (figure 5–4) have hardened ends, so it is best to use one of these tools to drive metal splitting wedges or to strike other metal surfaces.

Today, typical single-bit ax heads weigh 3½ to 4½ pounds and typical handle lengths range from 30 to 36 inches.

Competition-style (or -pattern) chopping axes (figure 5–5) appear to be the next evolution of the single-bit ax. Australian axmen designed and developed this pattern. This ax is often in the 5 to 6 pound range and has a wider blade and shorter handle length (28 to 30 inches) than a typical American ax. The competition chopping ax is an extremely efficient cutting tool, but the weight and typical handle length may not be appropriate for novice axmen.

Figure 5–4—A sledge hammer (top) and a splitting maul (bottom).

Figure 5–5—Keech and Tuatahi competition-style chopping axes.



Double-Bit Axes

Despite early versions of the double-bit ax discovered in Crete, which date back thousands of years, the modern double-bit ax is uniquely American. Throughout history, people have used axes to serve multiple purposes and to meet a variety of chopping needs, but they designed the double-bit ax (figure 5–6) specifically for felling trees.

During the 1800s, the westward expansion of population and the influx of immigrants resulted in resource development on an unprecedented scale. America was growing, and the construction of cities, towns, and factories required a steady supply of lumber. The mining industry and railroads played a significant role in the growth of America, and these industries relied heavily on timber.

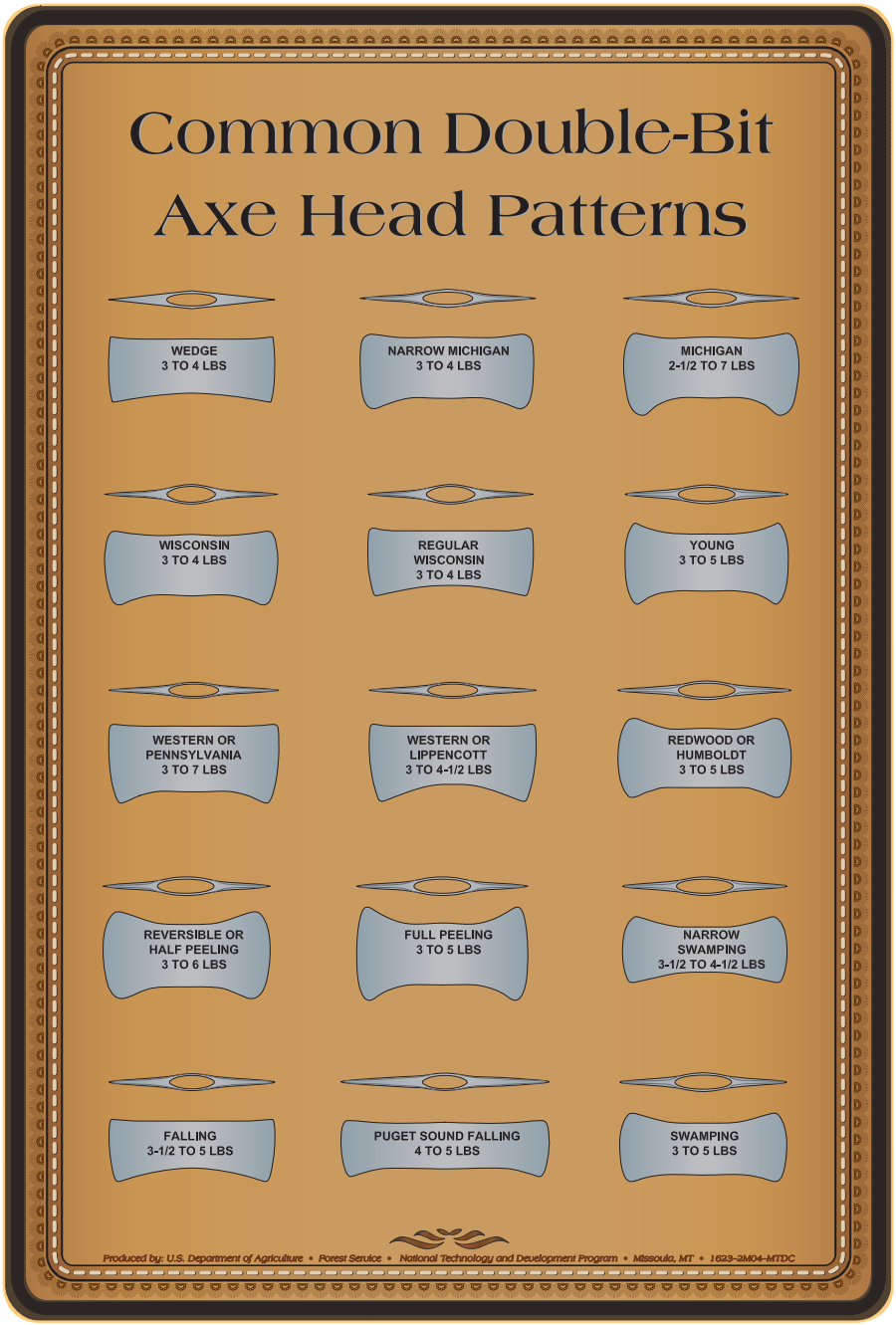


Figure 5–6—Common double-bit ax head patterns. Refer to "Appendix A—Full-Page Ax Illustrations" for a larger version of this illustration.

Crosscut saws were available in the early to mid-1800s, but saw manufacturers had not yet fully developed efficient cutting tooth patterns. This enabled the ax to remain the primary timber-felling tool. The modern double-bit ax began to gain popularity somewhere around the 1840s.

The logging industry employed thousands of lumberjacks to meet the growing demand for lumber. Frequently working and living in remote logging camps, these lumberjacks relied on their own tools for their livelihood. Back then, the loss of an ax could mean the loss of employment. Many stories describe how these loggers so cherished their axes that they carried them with them wherever they went.

Because companies paid lumberjacks by piecework or by the volume of timber they cut, the lumberjacks often searched for ways to increase their efficiency. The development of the double-bit ax provided the logger with two cutting edges instead of one.

Axmen will probably always debate the proper sharpening techniques for a double-bit ax. The Forest Service's preferred method is to leave one edge thinner and sharper and the other edge thicker so that it doesn't have as sharp a cutting angle. Ax nomenclature refers to the thinner, sharper edge as the "keen" edge and the thicker edge as the "stunt" edge. The difference in cutting edges allows axmen to use the proper edge for the type of wood they cut. The keen edge sinks deeper into wood that is free of knots and allows the axman to remove bigger chips. The stunt edge is better in harder, dense wood, such as tree limbs or knots, and allows the axman to work without bending, chipping, or otherwise damaging the cutting edge of the ax.

The visual differences between the keen and stunt edges can be subtle. Many experienced axmen rely on other visual indicators to identify the cutting edge they wish to use. These visual indicators could correspond with the side of the ax that has the manufacturer's mark or may be a mark the axmen place on the side of the ax or ax handle (figure 5–7). Personalizing the ax handle is a good way to identify which is the stunt edge and which is the keen edge.

Figure 5–7—This True Temper Kelly Works Flint Edge double-bit ax (stamped "CMSTP&P RR") has a mark on the handle that indicates the keen edge.

Pulaskis

The pulaski (figure 5–8) is the field tool that the Forest Service uses most commonly today. Named after Forest Service ranger Ed Pulaski, who saved most of his crew of wildland firefighters during the massive fires that burned Idaho and Montana during 1910, the pulaski is the Forest Service's primary firefighting tool.

The head of the pulaski has an ax blade on one side and a grubbing hoe (perpendicular to the ax blade) on the other. The grubbing hoe is similar in shape to an adz, but it is stouter and not as sharp. When properly maintained, the end of the grubbing hoe is sharp enough to cut roots, but stout enough to resist being chipped or damaged by rocks. Users can fell trees with the ax blade and dig fireline or build trails with the grubbing hoe. While it is an efficient firefighting or trail tool, the pulaski typically is a poor choice for felling trees, limbing, or for making precise cuts. Designed primarily for fighting fires, the balance of a pulaski makes it a poor replacement for an ax; a single- or double-bit ax is the better choice when chopping is the primary objective.

As with axes, the pulaski has gone through numerous changes through the years. Some designs incorporated wider hoe ends, reinforced hoe ends, different shaped hoe ends to increase cutting efficiency, and other design changes. While some of these changes modified the design, the basic pulaski design is still more or less the same as the original (figure 5–9).

Today, pulaskis have an average head weight of 3¾ pounds and a 36-inch handle. The pulaski has a straight, ergonomic, double-bit ax handle that allows the user to switch easily from the grubbing end to the ax end. Some taller members of trail and firefighting crews replace the 36-inch handle with a 40- to 44-inch handle (figure 5–10) to reduce stooping and back fatigue. The longer handle appears to provide better balance to taller people using the pulaski, though chopping accuracy decreases with handle length.

Figure 5–8—A Kelly World's Finest pulaski.

Figure 5–9—Early pulaski designs. Although designed as a wildland firefighting tool, early pulaskis were originally sold as grubbing tools.

Figure 5–10—A standard pulaski with a 36-inch handle (top) and a pulaski with a 44-inch handle (bottom).

The Forest Service Pulaski and the Man Who Designed It

The pulaski is one of the best known and most commonly used wildland firefighting tools in the world. The tool, and the man who designed it, deserve special recognition in this manual.

Edward Crockett Pulaski (figure 5–11) was most likely born on February 9, 1868, in Green Springs, OH, to parents of Polish descent. Pulaski's distant relative, Casimir Pulaski, fought under General George Washington during the Revolutionary War.

At 16, Pulaski headed west into the Idaho and Montana territories. He worked at various jobs over the next couple of decades before joining the Forest Service in July 1908 at age 40.

Known as "Big Ed," Pulaski wasn't a typical Forest Service employee. The Forest Service was in its infancy, and most employees at that time were young and college educated. Pulaski had a lifetime of practical skills learned from working outdoors.

Pulaski led a fire crew during the summer of 1910 when massive wildfires spread across North America, burning an estimated 3 million acres in Idaho and Montana and 40 to 50 million acres nationwide. He is credited with saving many crewmembers about to be overrun by fire. He recounted the story in the August 1923 edition of "American Forestry," stating, "On August 20 a terrific hurricane broke over the mountains. It picked up the fires and carried them for miles. The wind was so strong that it almost lifted men out of their saddles, and the canyons seemed to act as chimneys, through which the wind and fires swept with the roar of a thousand freight trains."

Pulaski knew the fire would overtake his crew. Of the roughly 120 men in the area, Pulaski was able to gather 45 men and lead them to a nearby mine tunnel. One of the men perished along the way.

Pulaski and the remaining 44 crewmembers, along with two horses, had barely entered the mine when the fire swept over the area. Some of the crewmembers panicked and wanted to run from the mine. Pulaski drew his pistol and warned, "The first man who tries to leave this tunnel I will shoot." He didn't need to use the gun.

As the fire swept over the area, the mine timbers caught fire. Water seeping into the mine enabled the men to hang wet blankets over the entrance and to fill their hats with water to throw on the burning timbers.

Figure 5–11—"Big Ed" Pulaski.

Some of the men, including Pulaski, eventually succumbed to the heat, smoke, and gasses, falling unconscious. When the air began to clear, and the crewmembers slowly regained consciousness, all but five of those who entered the mine had survived.

When it was safe, the crewmembers exited the mine and made their way across the burning logs and smoking debris to the town of Wallace, ID, more than 3 miles away. As Pulaski described the situation, "We were all in terrible condition; all of us were hurt or burned. I was blind, and my hands were burned from trying to keep the fires out of the mine. Our shoes were burned off our feet, and our clothes were parched rags. We were covered with mud and ashes."

Pulaski spent 2 months in the hospital with temporary blindness and pneumonia.

The Pulaski Tool

In the early days of wildland firefighting, firefighters had no specialized firefighting tools and used whatever tools they had on hand.

The history of the pulaski is a bit of a mystery. The Council Tool Company may have developed a similar tool for clearing land as early as 1876 (the author believes this tool to be the ax-mattock).

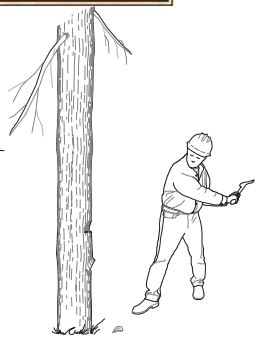
In one story, Earle P. Dudley, a Forest Service employee who worked with Ed Pulaski, claimed to have had a local blacksmith build him a pulaski-like tool out of a pick in 1907.

In another account, Coeur d'Alene Forest supervisor William Weigle sent rangers Joe Halm and Ed Holcomb to Ed Pulaski's hometown blacksmith shop in late 1910 or 1911 to build a specialized tool for planting trees. Halm and Holcomb cut one blade off a double-bit ax and welded a mattock hoe at a right angle to the remaining blade. They also added a removable shovel attachment. Forest supervisors evaluating the tool at a meeting in Butte, MT, during 1911 considered it inadequate for planting trees.

Pulaski continued to experiment with and improve the tool design, removing the shovel and reshaping and lengthening the ax and mattock blades. By 1913, Pulaski had designed and developed the tool that now bears his name (figure 5–12). By the 1920s, the pulaski became the accepted primary firefighting tool, and commercial tool companies began manufacturing it.

With only minor design changes and modifications, the pulaski has continued to be the primary wildland firefighting tool for more than 100 years.

Figure 5–12—The original pulaski, built by Ed Pulaski, on display in the Wallace Mining Museum, Wallace, ID.



Undercutter Axes

The undercutter ax (figure 5–13)—also called a chain saw ax or chisel ax—looks similar to a pulaski. Ax manufacturers originally designed the undercutter ax for the logging industry in the early days of the chain saw. Early chain saw carburetors had to be in a vertical position, making a diagonal undercut using a chain saw difficult. Rather than use a chain saw to make a diagonal cut, loggers made a series of close horizontal cuts and used the chisel end of the undercutter ax to chop out the wood between the cuts (figure 5–14). Manufacturers developed the undercutter ax to remove or clear the wood from the undercut. While the pulaski and the undercutter ax may look similar, the pulaski has a hoe end for grubbing in the dirt and the undercutter ax has a chisel end for removing wood. Manufactured between the mid-1930s and the early 1950s, undercutter axes were short lived but useful.

Figure 5–13—An undercutter ax.

Figure 5–14—Using the chisel end of an undercutter ax between two horizontal cuts to create an undercut.

Cruiser, Saddle, and Camp Axes

Forest Service crews do not use shorter-handled, lighter-weight axes as often as they once did. These smaller axes include cruiser axes, saddle (blazing) axes, camp axes, and boy's axes. Traditionally, cruiser or saddle axes tended to have double bits, while camp or boy's axes tended to have single bits.

Timber crewmembers especially liked the double-bit cruiser ax and carried it in their packs or on their horses. Crewmembers historically used the cruiser ax to mark timber and timber sale boundaries.

The original saddle ax—also known as the blazing ax—was smaller and lighter than the cruiser ax. People historically used the saddle ax (figure 5–15) as a light camp ax and for blazing trails. Blazing refers to the act of marking a trail by chopping bark off sections of trees, indicating a direction of travel. Traditionally, the Forest Service blaze was a small mark above a larger mark (figure 5–15, inset). The blaze looked similar to an upside-down exclamation point. Forest Service crews no longer blaze trails with an ax; they mark trails with appropriate signage instead.

Figure 5–15—A Shapleigh Hardware Company Diamond Edge saddle (blazing) ax.

The true cruiser or saddle ax has a double bit, up to a 2½-pound head, and a handle as long as 28 inches (figure 5–16). Commonly today, you may find an ax with up to a 3½-pound head referred to as a cruiser, but this is really a full-sized ax with a short handle. The difference is in the size of the eye of the head; a true cruiser, saddle, camp (figure 5–17), or boy's ax has a smaller eye to accommodate the traditionally smaller handle.

People tend to categorize these smaller axes together. They are popular with people using stock. Because these axes have shorter handles and lighter heads, they are best suited for intermittent use and not for chopping all day or for felling large trees.

Figure 5–16—This Collins cruiser ax with a 2¼-pound head on a 28-inch handle is well suited for light-duty chopping.

Figure 5–17—A Dillon Camp single-bit camp ax and a Marbles double-bit camp ax. Both axes have 2-pound heads.

Brush Axes

Although Forest Service trail crews no longer commonly use the brush ax (figure 5–18)—also known as the brush hook—it is an excellent tool for clearing small trees or heavy brush. The standard brush ax used by the Forest Service has long, hooked blades and is similar in thickness to a heavy machete. The blade fits a standard 36-inch single-bit ax handle. Other, less common brush ax models have round or oval handles. The sharpened inside edge severs small saplings or brush. The hooked upper end serves several purposes. People can use the hook to pull material into the blade and to pull the material out of the way after severing it. Another type of brush ax has a hooked blade and a chopping blade on the opposite side.

Manufacturers do not design brush axes for felling or bucking large logs; people use them as clearing tools. For smaller material, people can use one or two hands to choke up on the handle—holding the ax just below the head—and use it like a machete. For heavier material, they can use two hands and more of a full swing. The model the Forest Service uses has a typical head weight of about 3¾ pounds. Other styles range from 2½ to 6 pounds. Brush axes do not require an ax-type profile and are easier to sharpen because of their overall thinner blade design.

Using the brush hook to clear brush requires a degree of finesse. Because brush typically has multiple stems, the hook may be prone to catching on a branch or other obstacle, which may deflect the strike from its intended target. Rather than the overhead chopping motion used with an ax, the brush hook works more efficiently with an upward or downward side cut using a sweeping motion.

Figure 5–18—Three brush axes.

Swede Axes

The Swede ax (figure 5–19)—or Swedish brush ax—is similar to the brush ax. Some people refer to the Swede ax as a Sandvik, but this is strictly a brand name and other companies make similar tools. The Swede ax is not a true ax; manufacturers design it for cutting small brush and limbs. This tool has a removable or replaceable blade fixed to a yoke and handle. The steel cutting blade is typically 7-inches long, 1¾-inches wide, and 1⁄16-inch thick, and handle lengths range from 24 to 28 inches. The Swede ax is lightweight (about 2 pounds), making it an ideal trail tool for cutting small material. The short handle and relatively light weight allow users to hold the brush with one hand and chop with the other.

Like the brush ax, the Swede ax blade is much simpler and easier to file and maintain than a traditional ax. A mill bastard file is the proper tool for filing a Swede ax and a whetstone is the proper tool for sharpening it. If possible, try to maintain the shape of the factory edge.

Figure 5–19—A Swede ax.

Specialty Axes

As a necessary tool for a growing country, the ax evolved with society to fulfill a multitude of purposes. While this manual focuses on typical axes that the Forest Service uses today, the reader should understand that there are axes designed for other purposes. Some manufacturers design axes for splitting rails, notching logs, cutting ice, cutting sod, and butchering animals, to name only a few uses.

The ax and hatchet shown in figure 5–20 are two versions of Forest Service marking axes. The insets show the "US" stamp on the poll end of the ax and hatchet. The Forest Service used these marking axes to identify sale logs for commercial logging operations on National Forest System lands.

Figure 5–20—A Forest Service timber marking ax and hatchet. The insets show "US" brands.

Hatchets

Similar to specialty axes, there are numerous types of hatchets available (figure 5–21). Hatchets are basically small axes. Like axes, they come in different styles for different purposes. The standard hatchet typically has a head weight of less than 2 pounds and a handle length of less than 20 inches.

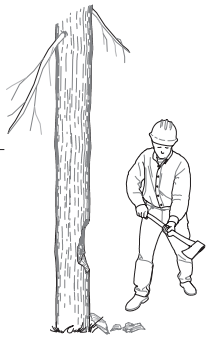
Few Forest Service field employees carry hatchets anymore because hatchets have limited applications in general forestry work. This is not to say that hatchets have limited value or that they are not useful tools. Hatchets are extremely useful for historic preservation work on log cabins and buildings. People commonly use the broad hatchet for this type of work. The broad hatchet is a smaller version of the broadax. Today, people commonly use other styles of hatchets for shingling or roof repair, carving, hunting, and camping.

Figure 5–21—Two Boy Scout hatchets; a Bridgeport with a steel handle (top) and a Plumb with a wooden handle (middle); and a broad hatchet (bottom). The broad hatchet, like the broadax, is used for shaping rather than general-purpose chopping.

Miniature Axes and Child's Axes

At one time, manufacturers and blacksmiths across America made numerous types of miniature axes (figure 5–22). Today, we may look at these tools as novelties, but they once served a more utilitarian purpose. These high-quality tools were excellent camp or kitchen axes, but their true value may have been as a child's first real ax. With the significant role that axes played in family life, everyone needed to know how to use the tool properly and safely. In the past, parents commonly gave children real tools, then taught the children to use the tools properly. Regardless of where these miniature axes were produced (in a factory or at home), they were important tools for learning critical life skills. Using these axes helped to instill a strong work ethic at a young age and taught children to respect tools and develop confidence in using them.

Figure 5–22—Miniature ax heads, from left to right: a single-bit ax head marked "Missoula, Mont.," a Norlund Hudson Bay pattern single-bit ax head, a Winchester broad hatchet head, and a Norlund double-bit ax head.



Survival Axes

While working on this manual, the author received numerous inquiries asking about the best type of survival ax. Those looking for a survival ax must determine their needs for the area of the country in which they live. Keep in mind that "survival ax" is a generic term made popular by the survivalist (or prepper) movement. In reality, any ax can be a survival ax if the user has the knowledge and skills to use it properly.

The ax can be an important survival tool, but it is not the only tool you need. Your overall survival skills and familiarity with the outdoors are more important than the style and weight of your ax. Skilled outdoors people may find that a small, lightweight ax or hatchet meets their needs, whereas people with less skill may be better off with a larger ax. Your ability to use and maintain an ax efficiently and safely, not the ax itself, will help to keep you alive in a survival situation.

To determine the type of ax that is appropriate for your needs, take into account your skill level and how you will use the ax. If you will use the ax primarily to chop wood for heat, cooking, or to build a shelter, a large ax may be preferable to a small one. Think about the energy you will expend and the calories you will burn. In a survival situation, these factors are critical. A heavy ax head with a long handle moves more wood in less time than a light ax head with a short handle. This is especially true for large-diameter logs.

Preservation Tools

Axmen use axes to chop wood. Heritage specialists use preservation tools (including axes) to shape logs into a finished product (e.g., a cabin, a floor, and so forth).

Broadaxes

The broadax—also known as a hewing ax—is not a typical chopping ax, but no ax manual would be complete without a few words about broadaxes.

The broadax (figure 5–23) is a favorite tool of Forest Service employees and volunteers who restore historic log structures across the U.S. The design of the broadax makes it the best ax for squaring or flattening the sides of round logs. Employees and volunteers also use broadaxes and hatchets for timber frame construction. The design of the broadax enables precise chopping using short, controlled strokes. Despite its large size and weight, people use the broadax with finesse (not power and force) to do detailed work and to shape logs.

The broadax head is similar in shape to a wood chisel. One side is beveled and sharp, while the other side is flat. This design helps users to cut a flat surface on the log. Broadax heads also typically have a slight cant (slope) beginning at the eye and extending to the cutting edge, which also helps users achieve a flat cut. If the broadax had a straight, flat plane from the cutting edge through the poll, it would not cut a flat surface as easily.

Broadaxes typically have short handles because longer handles impede the user's ability to perform fine hewing work. Broadax handles are generally offset for left- or right-handed users so the users do not scrape their knuckles on the log as they chop (figure 5–24). The offset handle and slight cant of the broadax head enable the user to achieve a flat cut.

Figure 5–23—A side view of a broadax showing the offset handle.

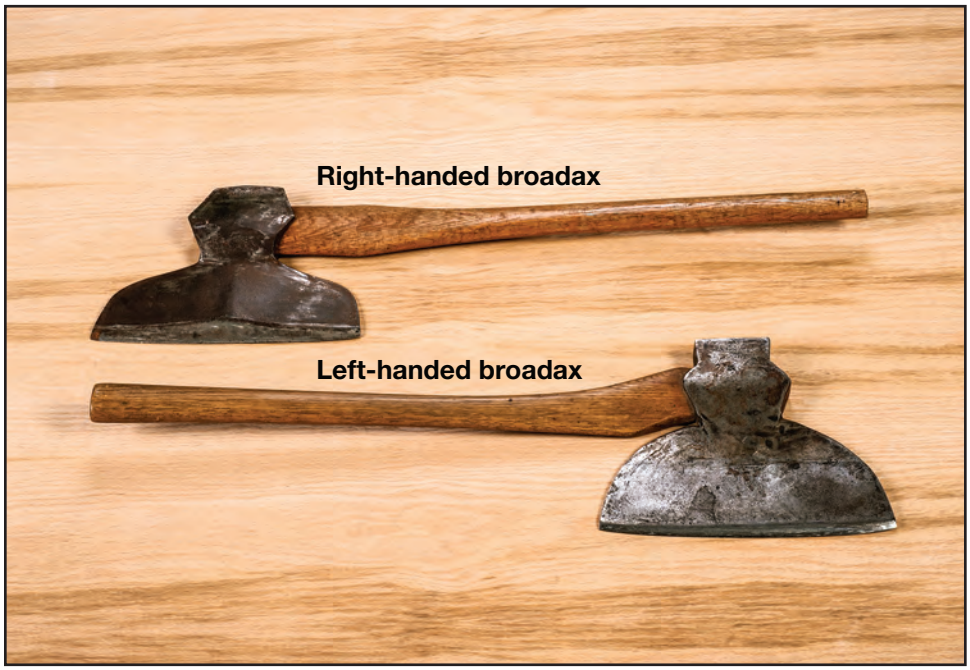
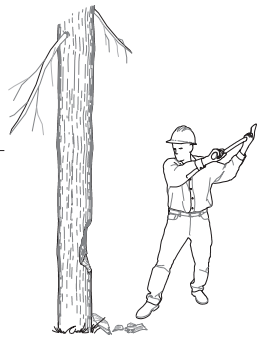


Figure 5–24—A broadax head and handle for a right-handed person and for a left-handed person.



Not all broadaxes have canted heads and short handles. Some broadaxes have a straight, flat surface (from the cutting edge through the poll) and longer, full-length handles (figure 5–25). This style of long-handled broadax provides speed and power where fine, detailed work (such as hewing railroad ties or bridge beams) is not required.

Broadaxes weigh more than standard chopping axes; typically a minimum of 5 pounds and frequently around 8 pounds.

Adzes

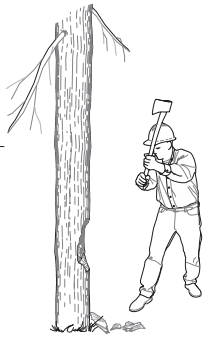
The carpenter's—or hewing—adz is not an ax, but an edged tool used for hewing logs. This specialized tool plays an important role in historic building preservation. It is usually a finishing tool and not a primary hewing tool. Preservationists use the broadax to make a flat surface and then use the adz to finish or smooth out the hewing gouges.

In some respects, the adz used for historic building preservation may look similar to a garden hoe, but the adz has a sharpened, chisel-shaped edge. For the types of log cabin restoration and historic preservation work that the Forest Service performs, the full-sized adz, the gutter adz, and the bowl adz (figure 5–26) cover the majority of the Forest Service's basic needs. The gutter adz and bowl adz have a scooped or concave head that is useful for making log cabin notches.

Do not confuse a hewing adz with an adz hoe—also known as a grubbing hoe. The adz hoe (figure 5–27) has a heavier and stockier profile that people use for grubbing and trail construction.

Figure 5–25—A broadax with a long handle.

Figure 5–26—Various adzes (right)—note the differences in curvature of each blade—and a gutter adz and bowl adz (below).



As with the ax, the adz comes in many different styles, depending on its specific use. Manufacturers design specialty adzes for building construction, shipbuilding, bridges, mining, and the railroad. The type of work performed determines the type or style of adz used. An adz used for fine or finishing work is lighter and has better balance than an adz designed for shaping railroad ties. Some manufacturers design adzes with a poll end for driving spikes, similar to a single-bit ax, while others design adzes with a pin on the back for placing wooden dowels.

The eye of the adz head is rectangular and tapered, and the curved handle contributes to the efficiency and ergonomics of the tool. The eye of the adz and the eye end of the handle are square. After placing the handle in the head, friction and motion hold the adz head to the handle, similar to a pick head and handle.

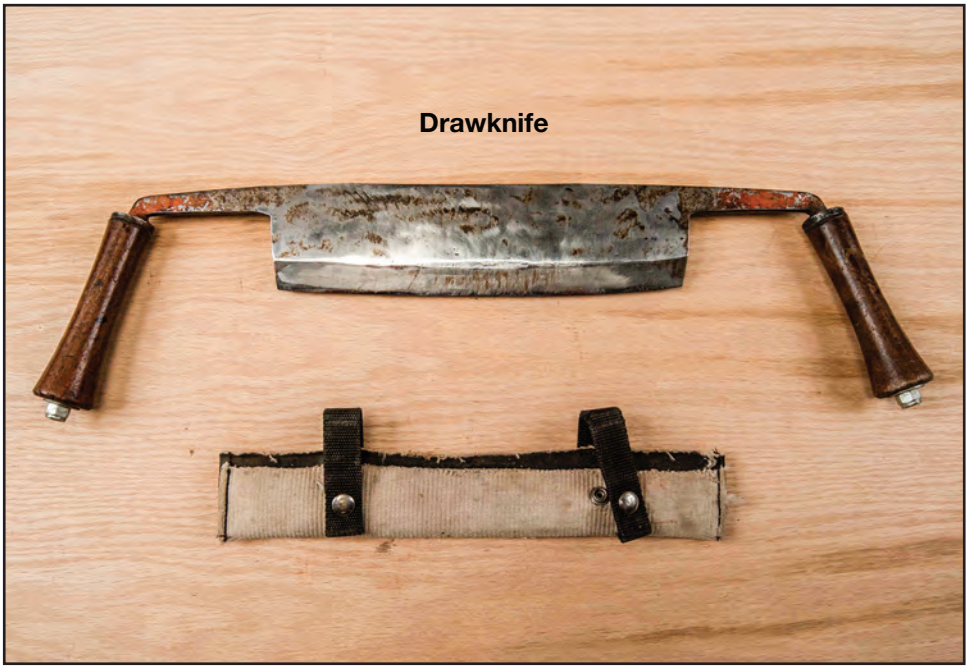
Figure 5–27—An adz hoe.

Other Preservation Tools

Some other edged tools that Forest Service historic preservation teams commonly use include a variety of chisels, froes, slicks, drawknives, and other types of tools (figure 5–28). The Forest Service National Technology and Development Program publication "Dovetails and Broadaxes: Hands-On Log Cabin Preservation" (1523-2802P-MTDC) <https://www.fs.fed.us/t-d/php/library_card.php?p_num=1523%202802P> provides information about many of these tools and about various preservation techniques.

Figure 5–28—A roofing hammer (right), a fro and mallet (below), a slick (following page, top), and drawknife (following page, bottom).


Slick


Drawknife