Selecting and Maintaining a Chain Saw

The chain saw has become an everyday tool for a wide variety of people. Homeowners use chain saws to cut firewood and to do general tree trimming around their homes. Farmers find them useful for such jobs as clearing land, trimming trees and cutting firewood. Contractors use them for cutting large timbers, crossties and landscaping ties and for land clearing. And the chain saw is still the tool of choice for professional loggers.

Types of chain saws

The first, and possibly the most important, step when shopping for a chain saw is to select a saw that fits your needs. Each type of chain saw has advantages and disadvantages. If you cut a lot of wood, you may end up with two or three saws for different situations.

Electric and ***cordless chain saws*** are the only types that can be used safely indoors, such as for carving in a workshop. These saws vibrate less and are quieter, lighter, cleaner and easier to use and maintain than gas models. Cordless chain saws are ideal for pruning and limbing small branches, and some owners are able to cut all their firewood with a cordless model. These saws do have drawbacks, however. Corded electric chain saws cannot be used outdoors in wet weather, and most must be used within 100 feet of an outlet. Cordless models have the issue of sufficient battery life.

Gas chain saws cut faster in general and can be used anywhere outside, even in rain or snow. But they are heavier and noisier than electric models, and the two-cycle engine requires additional maintenance. For a two-cycle engine, you will need to mix oil with the gasoline and store the fuel safely in an approved container that is clearly labeled, especially if you have other small-engine equipment that runs on gas alone. If you operate the chain saw infrequently, you should drain the fuel tank and add a stabilizer to the fuel mixture to prevent deposits from building up in the carburetor.

The Consumer Product Safety Commission (CPSC), in accordance with the American National Standards Institute (ANSI) Standard B175.1, classifies gas-powered chain saws into two groups based on engine displacement: those under 3.8 cubic inches (62.3 cubic centimeters) are intended primarily for consumer or homeowner use and may be called nonprofessional saws, and saws with larger displacement are considered professional saws. Similar classification have been established for electric chain saws.

Reviewed by
Hank Stelzer, Forestry State Specialist, School of Natural Resources

Chain saw weight

For comparison purposes, the weight of a chain saw is nearly always specified for the power head only, because the guide bar (the long metal frame that guides the chain) and chain (similar to a bicycle chain with a small sharp blade or tooth on each link) are offered in various sizes that are often changeable for a given power head. The bar and chain usually account for another 1.5 to 2 pounds, and a pint of fuel adds another pound or so to the weight of a gas saw.

Guide bars

The guide bar on a chain saw is intended solely to provide a guide track for the cutting chain. It is not intended to be used as a pry bar or lever. Some guide bars are equipped with a sprocket nose to reduce friction as the chain passes around the nose of the saw.

Match the size of the guide bar to the type of job you expect to do most often. It is safest to use a bar slightly longer than the diameter of the tree or log you cut but not so much longer that the tip is likely to hit the ground or another branch. For light and occasional use for limbing, cutting small logs and felling small trees, experts recommend a lightweight chain saw with a bar measuring 14 inches or less. For frequent log cutting and felling of small to medium trees, a midsize chain saw with a bar 14 to 20 inches long is best. Leave the heavyweight chain saws with guide bars over 20 inches to professional loggers.

Chain saw safety features

Low-kickback (safety) chain. Kickback occurs when the upper tip of the guide bar touches an object or when the wood closes in and pinches the saw chain in the cut. This contact may cause a lightning-fast reverse action of the guide bar back toward the operator, possibly resulting in severe upper-body, neck and facial lacerations or even death (Figure 1). One major difference between a professional and consumer chain saw is that a consumer saw must be equipped with a low-kickback, or safety, chain. Such chains are also available for professional chain saws and are highly recommended. *Low-kickback chains minimize the risk of kickback, but they do not eliminate the hazard.* When

purchasing a replacement chain for an existing saw, note that a chain with a blue label meets the low-kickback standard and can be used on any saw. Chains with a yellow label are recommended for professional use only.

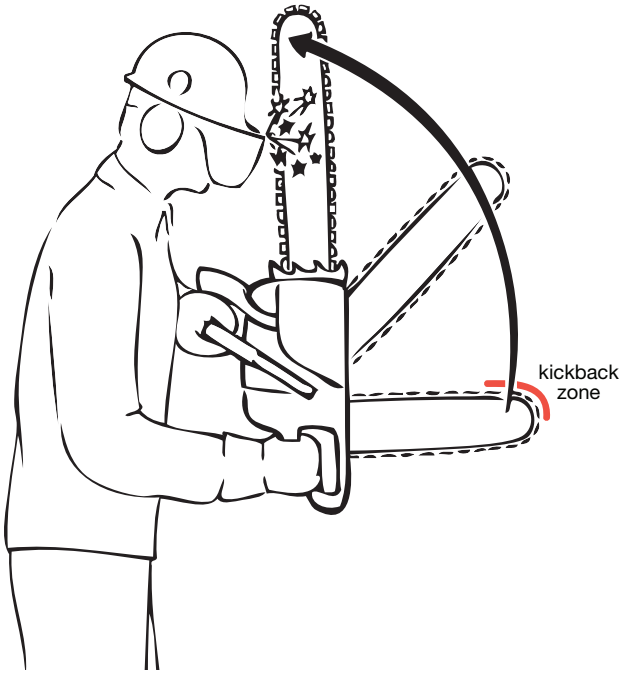

Figure 1. Kickback is the lightning-fast reverse action of the guide bar back toward the operator. Safety chains help minimize this risk of personal injury.

A ***wraparound front handle*** allows you to more easily adjust your grip to better balance the saw. A f***ront hand guard*** protects the front hand, and a ***C-shaped rear handle*** protects the rear hand. The ***chain catcher*** keeps a broken chain from flying back at the operator. A ***throttle trigger lockout*** prevents the operator from depressing the throttle trigger until the lockout trigger is depressed. A ***chain brake*** stops the chain's motion and can be activated in two ways. In addition to the front hand guard protecting the hand from moving toward the bar and chain, it also serves as a manual chain brake; if the saw kicks back and the guard bumps against the hand, the chain stops. The safest chain brake, however, is one that stops the chain earlier and automatically by way of an inertia sensor that detects rotation typical of a kickback. (Figure 2 illustrates these key safety features.)

An ***antivibration handle*** helps prevent discomfort and long-term hand injuries. The handle includes metal springs and/or rubber bushings that separate it from the vibrating engine and chain. This feature is important for anyone who operates a chain saw for more than occasional use in short sessions because vibration can cause irreversible chronic pain and numbness in the hand and wrist.

A ***spark arrester*** keeps sparks from being ejected by the exhaust. Sparks usually occur when carbon deposits in the cylinder break loose and are ignited by the exhaust gases. Spark arresters are required in many areas.

The ***chain oil tank*** on gas chain saws is usually designed so some oil remains when the gas tank is empty. Some gas chain saws have a translucent oil tank. The oil tanks on most electric chain saws have a window or are translucent so the oil level can be checked easily.

Electric chain saws should have a ***built-in circuit breaker***. This feature prevents an operator from pushing the saw beyond its normal capabilities, which can burn out the motor.

A ***scabbard*** covers the chain when the saw is not in use and helps protect a sharp chain. Scabbards are inexpensive accessories that can be purchased separately, however, so whether one is included is not an important factor in selecting a chain saw.

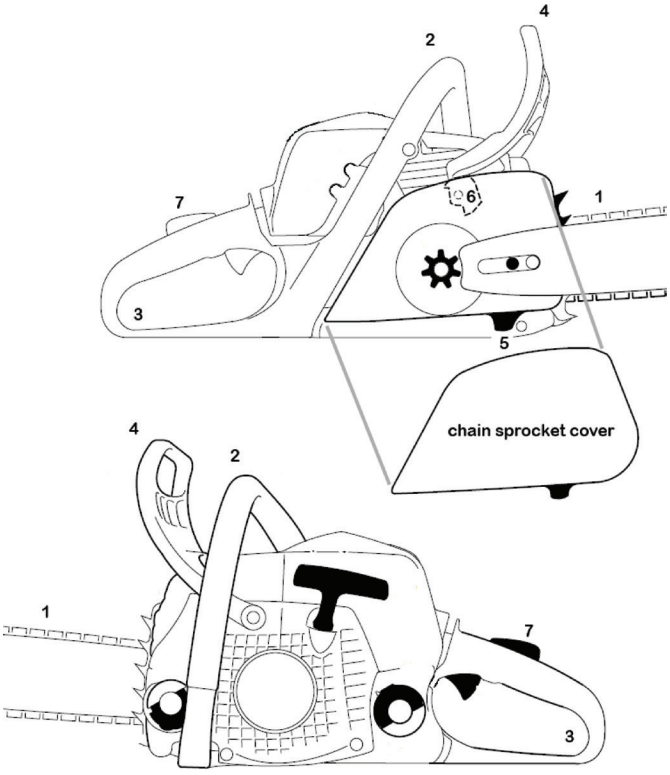

Figure 2. Key safety features to look for when selecting a chain saw: (1) safety chain, (2) wraparound front handle, (3) C-shaped rear handle, (4) front hand guard, (5) chain catcher, (6) automatic chain brake inertia sensor (the front hand guard serves as a manual chain brake), and (7) throttle trigger lockout.

Extra features

Some experts say that a chain saw with ***side-mounted chain-tensioning screws*** allows you to more easily see what you are doing than a saw with a rear-mounted tensioning screw does. Most reviews praise ***tool-free chain tensioning*** (with knobs at the side), however, the tensioning wheels can get easily clogged with sawdust and oil, making old-fashioned screwdriver adjustment more reliable.

On gas chain saws, look for a ***primer bulb*** and a ***decompression valve***. These features make starting the chain saw much easier. Spring-assisted starters get mixed reviews. Gas saws do not have electric starters, presumably because it would make them heavier.

Personal protective equipment

Personal protective equipment (PPE) can cost more than the saw itself but far less than a trip to the emergency room. PPE should be worn even when simply starting a saw to ensure it is running properly. Before you squeeze the trigger and pull the starter rope, put on hearing protection, goggles and leather gloves and chain saw chaps. See MU Extension publication G1959, *Operating a Chain Saw Safely*, for more information on PPE.

Prepare the saw

A saw in good condition is safer and easier to operate than one that has been poorly maintained. Preventive maintenance enables a saw to cut more wood quickly and safely. Maintenance includes ensuring the saw has sharp teeth, correct chain tension, proper lubrication, a properly tuned engine, and functioning safety equipment. Check the operator's manual for specific information.

A properly sharpened chain

Always run a sharp chain. A sharp chain will not only cut more effectively but will also help reduce operator fatigue, which in turn will help reduce accidents. Contact with dirt, rocks or metal will quickly dull and nick the chain's cutting teeth. The following signs indicate that your saw needs to be sharpened:

- The saw is cutting crooked.
- The cut produces fine sawdust instead of chips.
- You have to press down hard to keep cutting.
- You smell burnt wood as you cut.

Follow the owner's manual instructions for sharpening the chain. If you do the sharpening, use the proper tools. Wear gloves or place a shop towel or other heavy cloth over the chain to protect your hands from the sharpened cutters. The difference in height between the top of the cutter and the top of the depth gauge determines how well the saw cuts. Chain manufacturers recommend that the depth gauge (Figure 3) be lowered every third filing.

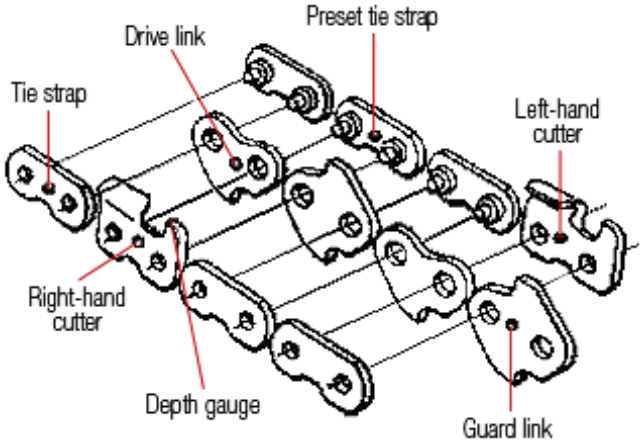

Figure 3. Parts of a cutting chain.

Correct chain tension

To ensure good cutting action and a long chain life, check chain tension regularly. If the chain is too loose, it will come off; if too tight, the chain will bind and overheat. All chains stretch with use and will require periodic retensioning. Most of the stretch occurs during the first half-hour of operation. Follow the manufacturer's recommendation on proper chain tension.

Check the guide bar and sprocket before placing a new chain on the saw. A worn sprocket can ruin a chain quickly. Conversely, an improperly fitted chain can also damage or prematurely wear out the sprocket.

Most manufacturers recommend that a cold chain be tightened to where the chain tie straps hang away from the bar about 1/32-inch at the center of the bar. A warm chain should be adjusted to 1/8-inch gap. Chains should be somewhat tighter on a bar fitted with a sprocket nose tip.

Proper lubrication

Lubrication prolongs a chain's useful life. In the summer, use either SAE 30 or bar and chain oil; in the winter, use SAE 10 or bar and chain oil. Do not use crankcase or other reclaimed oil because waste oils have reduced lubricating properties and can corrode the oil pump.

If the bar-oiling mechanism is not operating properly, serious damage to the chain and bar can occur in a short time. If the chain smokes while operating, it does not have enough lubrication. When the saw is started, make sure that the oil pump is functioning and that oil is lubricating the bar by holding the saw tip above a light-colored surface and accelerating the engine. If the oiler is operating properly, oil should splatter on the surface. If it doesn't, turn off the saw, remove the guide bar and check the chain oil discharge slot. Sometimes it becomes clogged with sawdust and must be cleaned out.

Functioning safety equipment

As mentioned, the chain brake is designed to stop the chain almost instantaneously. It is either activated manually or triggered by the inertial forces of the kickback itself. Refer to the owner's manual for the proper way to check the chain brake on your saw. Maintenance of this important safety feature is critical and should be done by properly trained service technicians.

Tool kit

To help ensure the continued operation of your saw, you should have a good tool kit containing the following items:

- Wrenches to fit all the nuts and lugs on the saw
- Screwdrivers
- Round file and file guide for touching-up the chain
- Flat file and depth gauge tool for setting the proper cutting depth
- Spare spark plug
- Owner's manual (sealed in a zippered plastic bag)
- Shop towels or similar heavy cloths

Table 1. Chain saw maintenance intervals.

		Before starting work	After finishing work or daily	After each refueling stop	Weekly	Monthly	Every 12 months	If problem	If damaged	If required
Complete machine	Visual inspection (condition, leaks)	X		X						
	Clean		X							
Throttle trigger, trigger interlock	Check operation	X		X						
Chain brake	Check operation	X		X						
	Have checked by dealer							X		X
Pickup body/filter in fuel tank	Check					X				
	Clean, replace filter element					X		X		
	Replace						X		X	X
Fuel tank	Clean					X				
Chain oil tank	Clean					X				
Chain lubrication	Check	X								
Saw chain	Inspect, also check sharpness	X		X						
	Check chain tension	X		X						
	Sharpen									X
Guide bar	Check for wear/damage	X								
	Clean									X
	Deburr				X					
	Replace								X	X
Chain sprocket	Check				X					
Air filter	Clean							X		X
	Replace								X	
Anti-vibration elements	Check	X						X		
	Have replaced by dealer								X	
Cooling inlets	Clean		X							
Cylinder fins	Clean		X			X				
Carburetor	Check idle adjustment; chain must not rotate	X		X						
	Adjust idling speed									X
Spark plug	Readjust electrode gap							X		
	Replace after 100 hours of operation									
All non-adjusting accessible screws and nuts	Retighten									X
Spark arresting screen in muffler	Check							X		
	Clean, replace if necessary								X	
Chain catcher	Check	X								
	Replace								X	
Safety labels									X	

Most chain saw manufacturers also sell multipurpose tools that function as a screwdriver, spark plug wrench and bar lug nut wrench. One of these tools and a round file and file guide can easily be carried to the woods in the pouch of your chain saw chaps. The other items can be left in the tool kit in a nearby location, such as a tool shed if working in the yard or a vehicle if at a distant site, until needed.

In addition to the tool kit, the following items are useful to have nearby:

- First-aid kit
- Multipurpose fire extinguisher (ABC rated)
- Sledge hammer and plastic wedges
- Sharp axe
- Extra bar
- Chain oil
- Extra cans of two-cycle motor oil to be mixed with gasoline (for gas-powered chain saws)

The fuel should be mixed according to the manufacturer's recommendations. Best results will be obtained by using oil that is intended for two-cycle engine use. Reclaimed or waste crankcase oil should not be used in the fuel mix. All fuel should be carried in a UL-listed approved safety can.

Maintenance and care

Table 1 lists chain saw maintenance intervals for normal operating conditions. If your daily working time is longer or operating conditions are difficult (for example, very dusty work area or resin-rich wood), shorten the recommended intervals accordingly. If you use the chain saw only occasionally, extend the intervals accordingly.

Troubleshooting

Most new chain saws come with a troubleshooting guide. Using it with time and patience, you can diagnose chain saw problems, save on repair bills and keep your saw working.

Credits: Figures 1 and 2 and Table 1 used with permission of STIHL Inc.

UNIVERSITY OF MISSOURI Extension

Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with and funded in part by the U.S. Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211 • MU Extension provides equal opportunity to all participants in extension programs and activities, and for all employees and applicants for employment on the basis of their demonstrated ability and competence without discrimination on the basis of race, color, national origin, ancestry, religion, sex, sexual orientation, gender identity, gender expression, age, genetic information, disability, or protected veteran status • 573-882-7216 • extension.missouri.edu