Chain Saws — Safety, Operation, Tree Felling Techniques

A chain saw is a valuable, labor-saving tool for homeowners, forest landowners, and professional loggers. When used improperly, however, it can cause serious injuries. Read and follow operating manual instructions provided with the chain saw.

Good judgment and common sense are essential to operating a chain saw safely. Equipment varies, but if a chain saw manual is not available, the following guidelines provide important information about chain saw safety, operation, and tree felling techniques.

Safety

Many safety advancements in chain saw design have been made, but accidents still happen. Chain saw users must observe safety practices. Working safely requires a personal commitment to being constantly aware of your actions and the possible reactions they may cause, as well as your surroundings.

Select a chain saw with good safety features, including features to reduce kickback and an anti-vibration system to reduce saw vibration to the user's hands. This reduces user fatigue and ensures greater safety. Chain saw operators should know their physical limitations, work slowly, rest often, and remain alert to potential problems and hazards. Saws also should be equipped with a continuous pressure throttle control system that shuts off the power to the saw's chain when pressure is reduced.

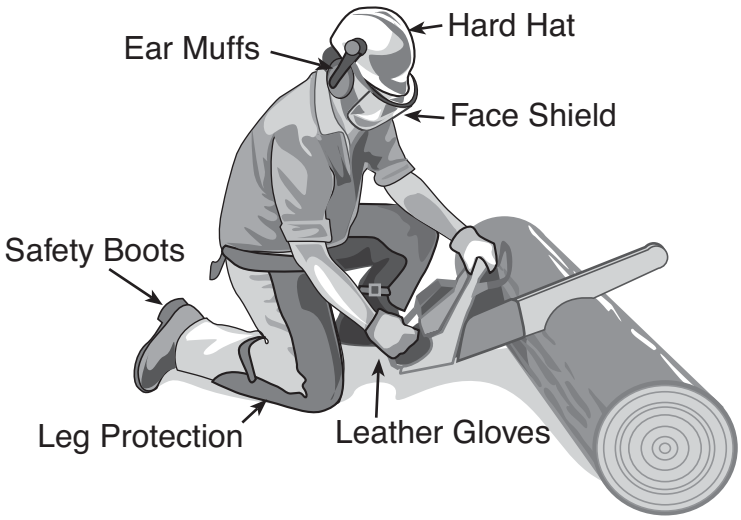
Wear comfortable, close-fitting clothing when using a chain saw. Also, include the following protective equipment (see Figure 1):

- safety boots with steel toes and nonskid soles.
- face shields or plastic goggles to prevent injuries from wood chips and sawdust.
- ear plugs or muffs to prevent hearing loss. Chain saw noise is greater than the human ear can tolerate. Sustained exposure can cause hearing loss that cannot be restored.
- heavy-duty, leather gloves to protect hands from cuts and scrapes.
- leg protective pants or chaps that cover the upper thigh to boot tops. Chaps protect against cuts and can stop the chain before it causes harm if it accidentally contacts the user's leg.
- first-aid kit available at the work site.

Before starting the chain saw, check the operating manual for the recommended fuel mixture, choke setting, and throttle control. Always start the saw with the chain brake on. Properly adjust the saw so the chain stops when the throttle is released. Start the chain saw at least 10 feet away from the fueling area. Always fill the oil reservoir when refueling the saw.

When starting the saw, hold the saw firmly on the ground with your right foot in the rear handle. Grip the front handle with the left hand. Be sure the area under the bar and chain

Figure 1. *Chain saw operator's safety equipment.*



This publication is an introduction to chain saws. Always read and follow owner's/operator's manual instructions. Further training is encouraged for advanced operating techniques. Contact the Kansas Forest Service or a reputable chain saw dealership for other learning opportunities.

is clear. Check to see that the starter mechanism is engaged, then pull the starter rope sharply with the right hand while keeping a firm hold on the starter handle as the rope retracts. Rev the engine briefly to release the throttle control latch and let the saw idle.

Another method of starting a chain saw that should only be used by experienced operators is known as the "crotch clamp" method. This involves the operator clamping the rear handle of the saw between his or her legs to stabilize the saw during the starting procedure. **Never start a saw on your knee or by drop starting!**

Operation

When handling the saw, the following techniques allow the user to keep control:

- maintain a firm footing with legs well apart to support the body. Keep the body away from the saw's cutting path. Keep the weight of the saw close to the body, arms slightly flexed, allowing the trunk and legs to carry the weight, relieving the load on the back and arms. The hands and arms mainly serve to guide the saw, bearing as little weight as possible.
- when working in a crouched position, avoid back strain by supporting the elbows on the knees.
- keep wrists straight to prevent muscle strain in the arms.
- keep the thumb around the front handle to prevent the saw from being wrenched from the hands in the event of a kickback. Let the left hand slide along the handle to keep the saw stable and to change positions.
- do not operate the saw with the power head higher than your shoulders.

The safest and least tiring way of sawing is to cut with the backward-running or lower part of the saw bar close to the bumper. Sawing with the forward-running or upper part makes it difficult to control the saw and increases the risk of kickback.

Do not overreach while using a chain saw. Overreaching causes loss of grip and chain saw instability. Avoid forcing the saw when cutting. Be alert for wire, nails, and other foreign objects in the wood.

Never carry a saw with a moving chain. The saw should be shut off or the chain brake engaged when carrying for distances of greater than 50 feet, or when terrain and other physical factors make carrying a running saw hazardous.

Chain saw kickback can cause serious injuries without giving the operator time to react. When cutting, the chain is traveling about 65 feet per second. If kickback occurs, it will be over within $^{2}/_{10}$ of a second. The most common cause of kickback is when the teeth come in contact with an object as they rotate around the tip of the bar. This causes the saw to kickback rapidly, backward and upward, toward the operator (see Figure 2):

Prevent kickback injuries by:

- holding the saw firmly with both hands.
- keeping the thumb around the top handle.
- using a saw equipped with a chain brake or kickback guard.
- watching for twigs that can snag.
- not pinching the bar.
- sawing with the lower part of the bar, not on the top near the nose.
- maintaining adequate saw speed when beginning or completing a cut.
- selecting chains designed to reduce kickback.
- avoiding situations where the nose of the bar is likely to encounter a fixed object.

Breaking chains can cause serious accidents and are nearly always the result of a poorly maintained saw. Because of the saw's high speed, the flying cutters can embed themselves in the body. There is little risk of breakage in a chain that is properly sharpened, well lubricated, and correctly adjusted for tension.

Figure 2. *Chain saw kickback*

Tree Felling Techniques

Accurate tree felling takes practice to master. Because of the hazards involved, never work alone.

The first step in felling a tree is to identify all the hazards around the tree, such as structures, power lines, roads, vehicles, and other trees. Also look for hazardous, dead branches or rot on the tree being felled. Make sure the area is clear of people and animals before beginning. Check to be sure the chain saw has enough gas and chain oil to finish felling the tree. Work behind and slightly to the side of the direction of the fall.

The second step is to determine the height of the tree and the direction it should fall. The tree's high center of gravity causes instability and makes its movement difficult to predict and control. Other factors to consider in felling a tree include wind direction and

velocity. Never attempt to fell a tree into the wind. Trees that have a definite lean should be felled in the direction of the lean, if possible.

Other factors to consider in felling a tree include:

- large branches on one side.
- a crooked trunk or crown trunk decay, which can affect the direction of fall and may be unpredictable.
- other trees near the one being cut.
- the slope of the ground in the area.

The third step is to plan an escape route. Ideally, escape routes should be selected at 45-degrees to the rear of the expected fall line. These routes should be cleared of any debris or underbrush that may impede the operator's movement.

The fourth step is making the notch cut. This cut determines the direction of the fall and reduces splitting of the tree. For trees more than 10 inches in diameter, a notch cut is recommended to help control the direction of the fall. The depth of the notch cut should be about one-third the diameter of the tree, with the wedge cut making a 45-degree angle. Make the top cut of the notch first at 45 degrees. The bottom cut of the notch should be level and meet the top cut (See Figure 3).

The final cut is the back cut, or felling cut. It is made opposite the notch cut and should be 1 to 2 inches above and parallel to the horizontal cut of the notch cut. Never make the back cut lower than the horizontal cut. Stop the back cut about 1 to 2 inches before cutting through to the undercut notch. The holding wood left uncut in the tree's center acts as a hinge to control the direction of the fall. If the back cut goes completely through, the tree may swivel on the stump, slide, or bind on the bar and chain.

If the tree is larger in diameter than the length of the chain saw bar, cuts on each side of the tree may be needed.

Keep an eye on the top of the tree and the back cut for signs of movement. If the tree begins to fall in the intended direction, immediately stop the saw, set it down away from the path of the falling tree, and retreat diagonally away from the direction of the fall. Do not stand near the tree and watch it fall. A falling tree can bounce back and strike the chain saw operator.

If the tree leans back, closing the back cut and binding the saw's cutting bar, remove the saw or stop the engine and drive one or two wedges into the back cut. Wedges should not touch the chain or cutting bar.

Once the tree is felled, look over the area and tree carefully to determine how the tree will respond when cutting the trunk into usable log lengths.

Limbing and Bucking

Limbing is the removal of unwanted branches from the trees. Start limbing from the base of the trunk, working toward the top of the tree. Work slowly and cautiously. Accidents frequently occur during limbing because footing is poor and obstructing branches impair vision and cause kickback injuries. For protection, keep the tree trunk between yourself and the branches being cut. If the tree is lying on a hillside, however, always limb from the uphill side. Do not walk on the tree trunk because it can roll. Maintain footing by clearing away the cut branches, and be alert for nails and wire in the wood. Be aware that removing limbs changes the tree's balance or its support and can cause it to roll to one side.

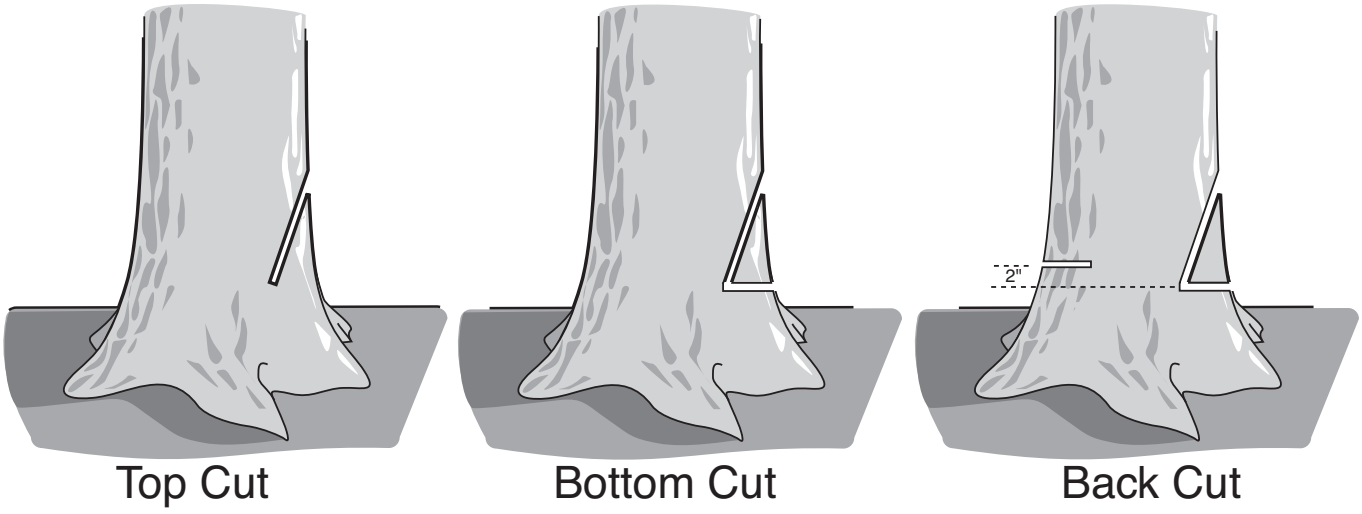
Cut as close to the trunk as possible. Support the saw against the trunk when using the forward running part of the chain. This reduces fatigue and strain. Run the saw at full throttle as it cuts into the limb.

Pull the saw across the trunk and support the saw against your right leg. The guide bar will then be in the correct position for removing the limbs on top.

Using full throttle, move the saw forward, using your legs to keep it pressed against the trunk. Use the forward-running part of the chain. Tilting the saw will be easier if it is lifted slightly.

Support the saw against the trunk and your right leg when limbing the

Figure 3. *Proper notch cut.*



Illustrations of cutting techniques are one of several options. Cutting situations vary. No single technique is correct in every situation. Always proceed with caution in unfamiliar conditions. Never attempt cuts beyond your experience and comfort level.

side next to you. Use the backward-running part of the chain.

When sawing top limbs, move the saw forward, using the trunk to support the saw. Tilt the saw to the right, using the thumb to operate the throttle.

When sawing limbs on the other side, support the saw against the trunk and use the backward running part of the chain. Move forward only when the guide bar is moving downward on the other side of the trunk.

Remove the underneath branches last, using the forward-running part of the chain. For support, rest your right hand against your right knee. Never let the chain saw cut into the ground.

Bucking is the process of cutting the tree into usable lengths. When bucking the tree, be sure to maintain sure footing, hold the saw firmly in both hands, and stand to one side as the cut is started. Care should be taken to avoid cutting all the way through the log and hitting rocks or soil that will damage the chain. Also, keep an escape route open in case the trunk kicks out.

Allow the saw to pull into the log against the bump spikes when sawing.

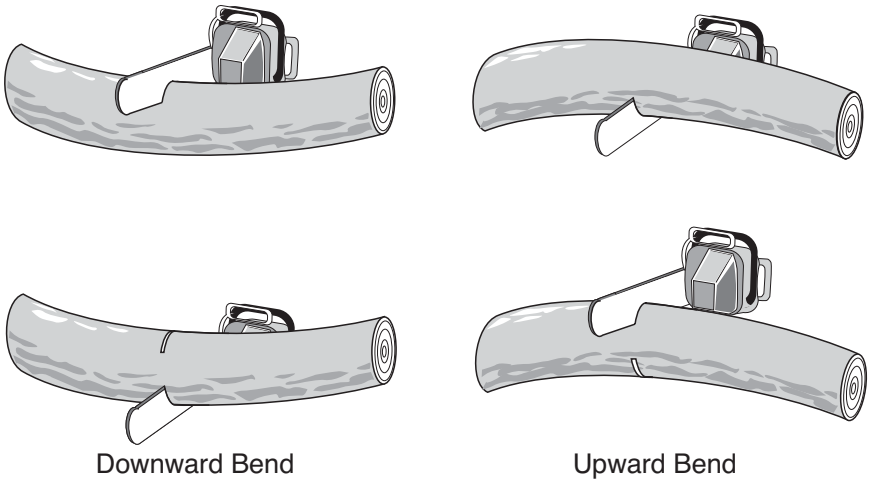
If the trunk has a downward bend, start the cut in the top and then saw from underneath. When the bend is upward reverse the cutting sequence (see Figure 4).

Moderate tension in the trunk requires a cut through half the trunk with the saw upright, then quickly sawing through the remainder of the trunk. If the trunk is under tension, prevent the saw from binding by first cutting a wide notch in the inside of the bend. Saw a little at a time, slowly, until the trunk breaks. Be ready for kickback.

When working on sloping ground, stand uphill from the log and see that no one is working below the bucking area.

Preventive maintenance and careful use are the best insurance against accidents and breakdowns.

Figure 4. *Proper bucking techniques.*



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