

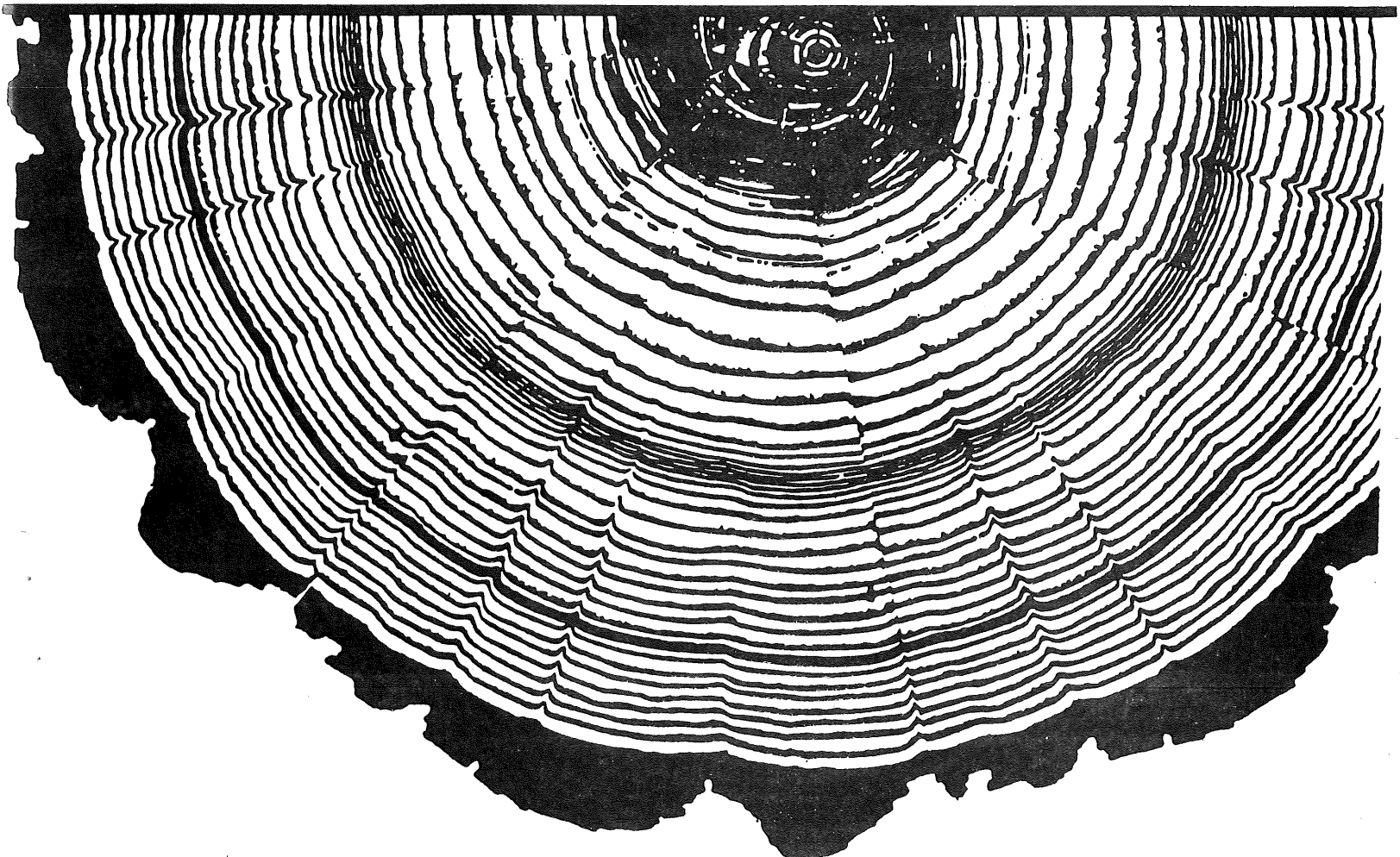
62732  
200 sp.

DNR,  
3 copies

# CHAIN SAW SAFETY

861018

## Operators Information Manual



NOT FILMED  
April 1986

This document is made available electronically by the Minnesota Legislative Reference Library as part of an ongoing digital archiving project. <http://www.leg.state.mn.us/lrl/lrl.asp>  
(Funding for document digitization was provided, in part, by a grant from the Minnesota Historical & Cultural Heritage Program.)

### Safety & Health Program



### Department of Natural Resources

## REFERENCES

1. Tilton Equipment Company, Wood Harvester's Handbook.

Importers and Distributors of Jonsereds & Olympek Chain Saws.

2. Oregon, Saw Chain Maintenance Manual
3. STIHL, Chain Saw Safety Manual - 1982.
4. Professional Safety, December 1982, p. 15-18.

The Consumer Product Safety Commission estimates that chain saws were associated with over 123,000 injuries requiring medical attention and 50 deaths in 1981. An examination of pertinent statistics reveals that the number of injuries involving chain saws almost doubled between 1976 and 1981.

This booklet contains strategies that if followed will make substantive progress toward reducing chain saw injuries. These strategies include:

- \* Selecting and maintaining the chain saw;
- \* Following pre-operational precautions;
- \* Using established "Safe Practices" while operating the chain saw.

## Selecting and maintaining the chain saw

The following safety features should be looked for in selecting a chain saw:

- \* One or more anti-kickback devices;
- \* Chain catch pin;
- \* Rear handle knuckle shield;
- \* Hand guard;
- \* Throttle interlock;
- \* Vibration isolation system;
- \* Noise/spark suppressing muffler;
- \* Automatic oiling; and
- \* Good balance;

Perhaps the most important safety feature on a chain saw is one or more anti-kickback devices. Kickback accidents account for nearly one in every four reported chain saw injuries. Kickback is described as the sudden and potential violent rearward and/or upward movement of the chain saw. It can be caused by interference with the movement of the saw chain. And, it can thrust the chain saw back at the operator at lightning speeds and with tremendous force. Sudden interference with the movement of the chain can occur when a traveling chain cutter passes over the upper tip of the guide bar, where a greater percentage of the cutter is exposed, than on the normal flat cutting area of the guide bar. If this upper tip is introduced into wood or accidentally into some other object, the cutter will many times take a large bite and cause the saw chain to stall (nose tip kickback). Kickback can also occur when the saw chain on the top of the bar binds in a cut or hits a solid obstruction in the wood (pinch kickback). Much like an electric drill snapping when the bit stalls, the energy that is driving the saw chain is

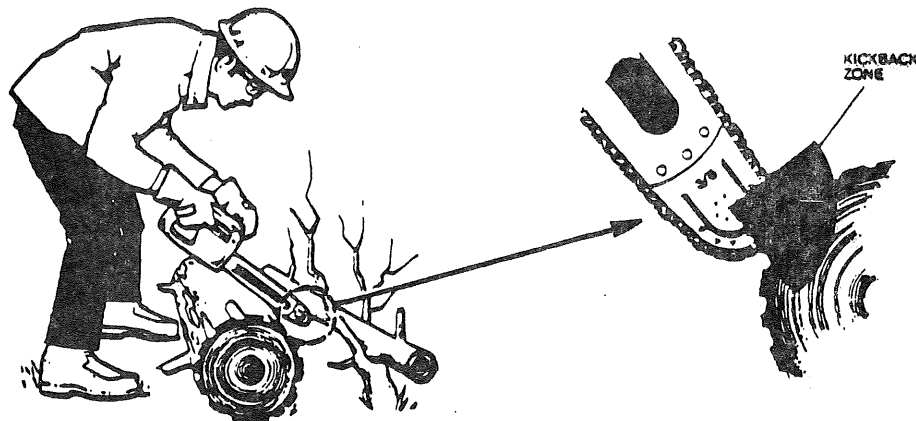
transferred into the movement of the entire saw. This shifting of forces in most cases causes the saw to rotate and travel backwards which is usually back towards the operator. As the guide bar comes backward, it will pull the saw chain out of its stalled position and allow it to begin rotating while still moving towards the operator, making it that much more dangerous.

## **WARNING!**

### **Guard Against the Danger of Chain Saw Kickback.**

Kickback is the backward and/or upward motion of the chain saw guide bar occurring when the saw chain near the nose or the top area of the guide bar contacts any object, such as another log or branch, or when the wood closes in and pinches the saw chain in the cut.

Kickback can lead to dangerous loss of control of the chain saw and result in serious injury to the saw operator or someone standing close by.



### **POTENTIAL KICKBACK SITUATION**

Illustration #1

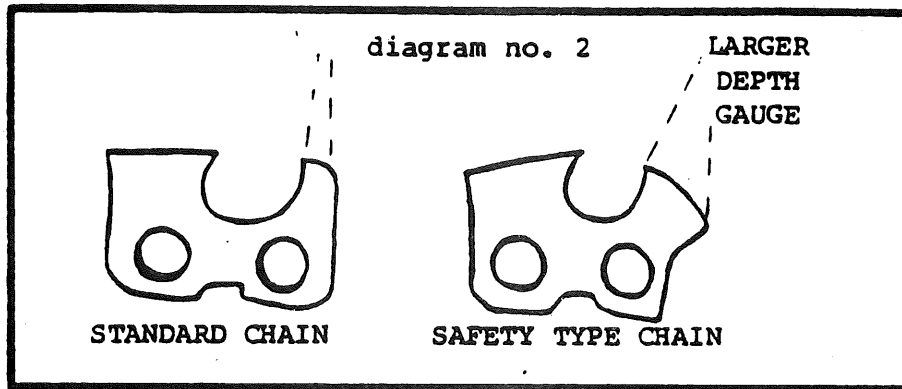
In tests it has been established that it only takes 1/10 of a second for a chain saw to travel from a horizontal cutting position a full 90 degrees upward toward the operator during kickback. Many people believe they would be able to react fast enough to push the saw away or move out of the saw's path of travel. But the fact is that the average reaction time for a response to kickback even if it's occurrence is anticipated is only 1/5 of a second. Therefore it is possible that in the 0.2 seconds it takes to respond, the chain saw could kickback up and down twice contacting the operator before he/she knew what happened.

There are anti-kickback devices available on the market to date, some of which are: the "banana nose bar", "safety chain", and the "chain brake".

The banana nose bar helps reduce kickback by decreasing the diameter of the bar tip where (nose tip) kickback occurs.

Safety chain is designed to reduce the occurrence of kickback by minimizing the tendency to catch or "hang-up" in the wood. These chains tend to have a lower profile, unique cutting pitch, and larger depth gauge than traditional chains. Often times a safety chain is used effectively with a "banana nose bar".

Use a "safety type" chain. These will help reduce the energy of the kick if kick-back occurs. KEEP IT SHARP - MAINTAIN PROPER DEPTH GAUGE SETTING - AND ALWAYS CUT AT FULL SPEED.



WARNING:  
NO SAWCHAIN TO THIS DATE WILL TOTALLY ELIMINATE KICK-BACK.

Illustration #2

A chain brake stops the chain's rotation after kickback occurs. The brake is commonly actuated by a mechanical switch incorporated into a front hand guard. When kickback occurs the saw rotates around the front handle causing the lead hand, wrist or forearm to push the front hand guard forward actuating the brake. Chain brakes are designed to stop the chains rotation in 1/25 of a second, thus reducing the severity of an injury once kickback occurs.

The front hand guard is a mechanical barrier (shield) between the front handle and the saw chain. The shield is designed to prevent the forward hand from slipping off the handle and into the chain during a kickback. As stated earlier the guard often serves as a device to actuate the chain brake.

Throttle interlocks on some chain saws require two hand placement on the saw to advance the throttle, and others prevent accidental depression of the throttle trigger. Many chain saws with these features are also equipped with another safety feature called a "throttle latch lock". It improves control while starting the chain saw by holding the saw throttle slightly open.

## Other safety features

Vibration isolation systems minimize vibration transmission to the operator. Positive benefits from these systems include reductions in fatigue, noise levels and vibration related disorders such as Raynauds Disease (white fingers) and prostatitis.

Chain saw mufflers suppress noise and frequently serve as spark arrestors. Operating a chain saw without an appropriate spark arrestor is prohibited on all federal properties and most state land.

Automatic oiling of the saw chain allows the operator to keep a grip utilizing all of his/her fingers for better control, and also enables him to concentrate on the cut that is being made.

During chain saw operation there is a possibility of chain breakage. When this occurs a chain catch will protect the operator by doing just as the name implies; catch and bunch up the loose chain into a space under the saw. In addition to the catch pin, an extension or knuckle guard on the bottom of the rear handle will reduce the possibility of a broken chain slapping the operator's hand or forearm.

## Before you start the saw

There are pre-operational precautions to always be considered prior to chain saw operation. Long hair and loose jewelry must be secured to prevent entanglement. A properly equipped first aid kit and a suitable fire extinguisher should be available. Fire fighting and emergency plans of action should be agreed upon by cutting buddies and/or teams. Remember, never cut or allow anyone else to go out and operate a chain saw by themselves.

The chain saw operator should wear appropriate personal protective equipment at all times when performing cutting tasks. Standard equipment includes a hard hat, safety eyewear, sure grip gloves, hearing protection, non-slip soled, safety toed footwear, and trim fitting clothing. Some special designed ballistic nylon clothing is available for additional protection.

Before the operator starts the chain saw it should be thoroughly inspected, and any deficiencies noted should be repaired. Common deficiencies include:

- \* Loose nuts, bolts, and screws that have vibrated loose through operation;
- \* Dull, excessively worn, improperly tensed, or lubricated chain;
- \* Damaged guide bar, such as nicks, dents, cracks, or wrapping;
- \* Excessively worn or damaged muffler/spark arrestor;
- \* Frayed or damaged starting or electrical cords and connections.

Manufacturer's specifications should always be followed when repairing any deficiencies or adding fuel or lubricants.

The likelihood of muscle strain and back injury while cutting may be reduced by thoroughly stretching and warming up before starting the cutting operation. And, also, by not attempting to lift or move heavy objects alone or without a mechanical device. Special attention should be given to stretching and warming up lower back, leg, and abdominal muscles.

Cutting areas should be cleared of unnecessary persons, physical obstructions, and animals. Logs should be inspected for decayed areas and/or foreign bodies such as nails, staples, or fence wire. Cutting through decayed areas unexpectedly accelerate the saw through the log, and contact with foreign bodies can damage or break chain and cause kickback.

Before felling a tree, clearances in all directions should be assured and clear escape routes should be identified, diagonally to the rear, away from the falling tree.



Illustration #3

Other considerations are:

1. Check to see which way it leans (consider branch weight).
2. Check wind direction (don't fell trees into strong winds).
3. Look up into the top of the tree for any dead branches or tops which may free up and drop when you attempt to fell the tree. These are called "widow makers." If you find a widow-maker, get a spotter (another person) to watch it and warn you if it begins to move. Otherwise, avoid felling the tree.
4. Check to see that your work area around the tree trunk is free from obstruction.
5. Make sure there is no one in the general area of the intended fall before making the final cut.
6. Watch for power lines, or vehicles where it is possible that the tree may fall onto roadway.
7. Remember you can always avoid felling the tree entirely.



The saw should be started on firm ground away from branches, twigs or other possible entanglements and at least 50 feet from fueling area. To assist in stabilizing the saw when starting, place the toe of your right foot through the rear handle, and hold down the front handle with your left hand. On some of the older model saws where the handle is on top of the power head, this technique may not be appropriate. Never the less, a two point hold down should be used. Never drop start a chain saw!

While operating, grip the chain saw firmly with both hands, encircling the handles with the thumbs and forefingers. Then using a well-balanced stance with stable footing, begin the cut at full throttle and maintain it throughout the cut. Slower speed will increase the possibility of kickback and binding. The log or limb being cut should be in direct contact with that part of the cutting bar nearest the power head. Many chain saws have "bumper spikes" to help maintain this position. The chain saw should be allowed to do the work. Attempting to force the saw through the wood reduces saw control and increases operator fatigue.

When the cut is finished, the trigger should be released, and the saw chain should come to a complete stop before repositioning for the next cut. Should the saw chain continue to rotate after the trigger is released, and touching it to a tree or log does not stop its movement, discontinue operation and make necessary repairs. If it is necessary to carry the chain saw to another location, the engine/motor should be stopped, guide bar covered with a scabbard (sheath) and carried with bar pointed behind the operator. Cut only one log at a time!

As refueling becomes necessary, the saw must be turned off, placed in an area free of combustible debris and allowed to cool before adding fuel. Many experienced chain saw operators use this time to inspect or adjust the saw, clear the work site and plan further cutting. It is also a good time to take a well needed rest. Never smoke when dispensing or near fuel!

## Always use established safe practices

In addition to using a saw equipped with anti-kickback features, the chain saw operator can take some positive measures to reduce the likelihood of kickback:

- \* Don't touch the tip of the saw to any object while the saw is running;
- \* Be alert for shifting of the log or other forces that may cause the cut to close and pinch the chain;
- \* Always hold the chain saw firmly with both hands;



- \* Use the proper grip. Grasp the forward handle with your left hand, palm down, wrapping your fingers around the handle bar, keeping it in the webbing between your index finger and thumb. Grasp the rear handle firmly with your right hand;

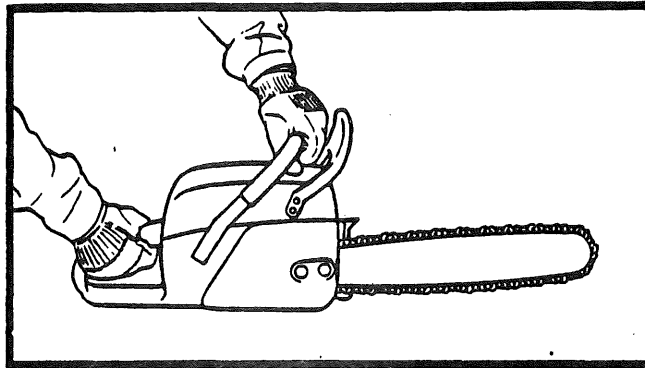


Illustration #4

- \* Boaring cuts requiring burying the nose or the tip area of the saw in the wood of a large log or tree. This could cause kickback if not done properly, therefore, if advanced training has not been received leave boaring to the professional or very experienced amateur;
- \* Use wedges to avoid pinching the bar when cutting larger pieces;
- \* Use a well-balanced stance;
- \* Avoid cutting limbs above your mid-chest height;
- \* Use a saw horse or similar device to support and hold logs when possible;
- \* A very important rule is to maintain sight of the upper tip of the bar whenever the chain is rotating. Try to prevent its contact with wood or any other object. If you have to bury the tip in wood to cross cut a large log, be sure to fully extend your left elbow so that you are braced should kickback occur;
- \* Keep the saw chain (preferably "safety chain") sharp, and always cut at full throttle;

## PARTS OF A CUTTER...

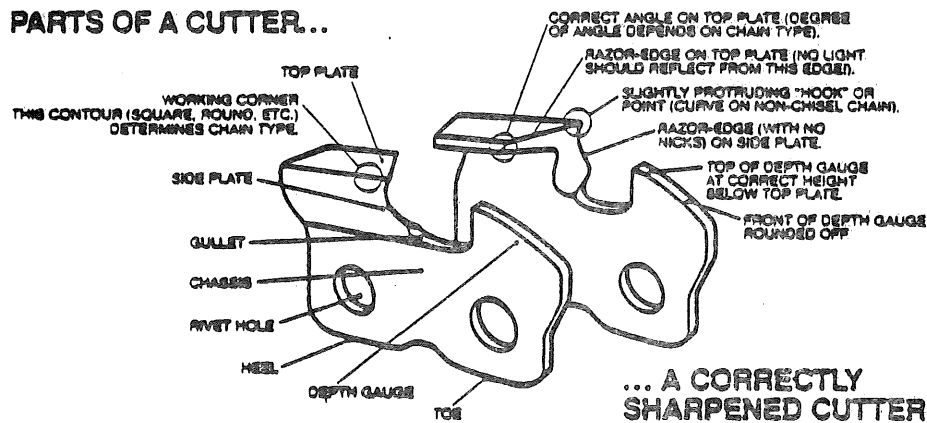


Illustration #5

\* Use as short a guide bar as reasonable,

### REASONS:

1. Use of a shorter guide bar will make it easier to keep sight of the tip.
2. A shorter bar will develop less energy in a kickback.
3. You have less weight to carry (less fatigue).

There are many tasks that should not be performed by a chain saw and many chain saw tasks which should only be undertaken by an experienced amateur or a professional. Moreover, there are some postures and behaviors which covet danger. Two of the more common misuses of chain saws include using them for cutting cut back brush or shrubbery. These tasks are better performed by other machines or tools such as brush hogs, weedwhips, trimming shears, axes or hand saws which are designed for this purpose.



Illustration #6

Allowing someone to hold a limb/log while it is being cut or holding the like with one hand and operating the saw with the other is a very dangerous practice. Always keep two hands on the saw at all times while the chain is moving.

Remember, ladder work, tree climbing, boarding cuts, and felling large trees involves the use of special equipment, techniques and advanced training.

#### To Help Avoid Kickback ▲

**DON'T** let the tip of the bar and chain contact other objects while the chain is moving.  
**DON'T** run the engine slowly at the start or during the cut.  
**DON'T** cut with loose or dull chain.  
**DON'T** cut above shoulder height.  
**DON'T** cut in awkward positions (off-balance, out-stretched arms, one-handed, over reaching).  
**DON'T** relax your grip. Always use the proper grip, use both hands. Place thumbs on opposite side of handle from fingers.

#### Caution ▲

Be absolutely sure to thoroughly read the Operator's Manual supplied with your Chain Saw.  
Follow exactly manufacturer's saw chain sharpening and maintenance instructions.

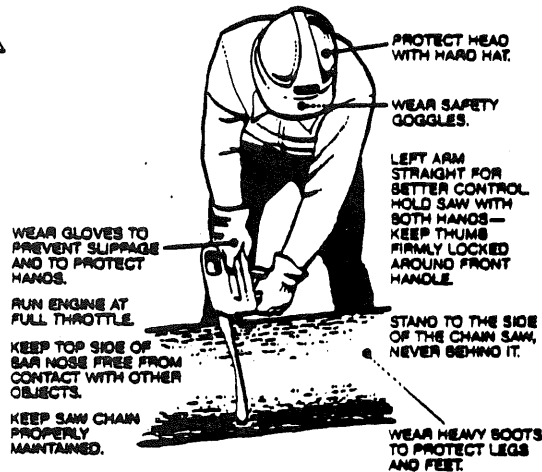


Illustration #7

The chain on most saws rotates at approximately 48 miles per hour, which figures out to be 550-600 teeth per second moving past a stationary point. Under these circumstances it doesn't take long to scar for life or possibly end a life.

Basically there are three steps to follow in felling trees. They are the notch, the back-cut and the hinge.

## The notch

The first step will be the notch. Begin with the upper-cut. Let the front handle on your saw point in the direction of the intended fall. Holding the saw in that position, begin the cut, at approximately a 20° angle, into the trunk. Continue the cut until the cut takes up two-thirds of the tree's total diameter. NEVER saw MORE than one third of the way through the trunk.

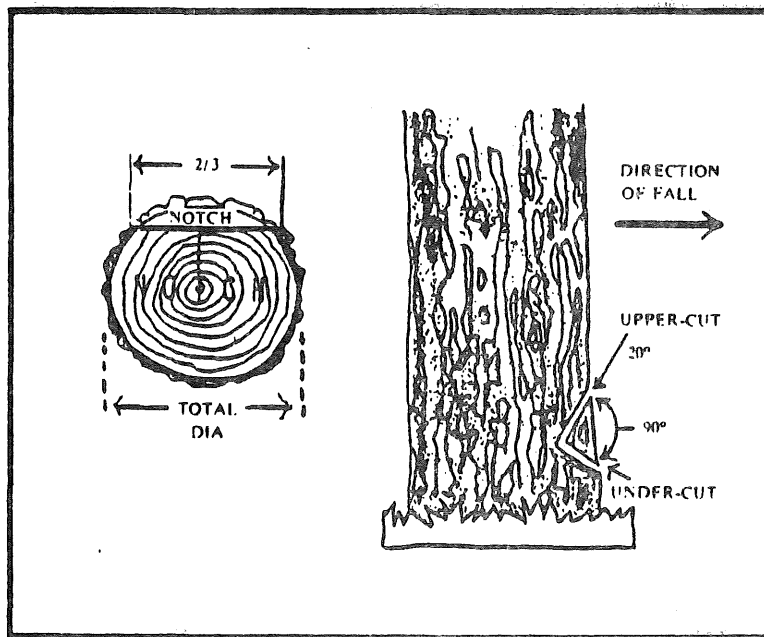


Illustration #8

Remove the saw and position it for the under-cut. Begin the under-cut. Slope it slightly upward (from the ground up). Use your thumb on the trigger. Sight down through the previously made upper-cut; this will help you to align the two cuts. Try to create a notch opening of 90 degrees. The use of the 90 degree notch will help prevent fiber-pull and splitting of valuable saw logs.

## The back-cut

(There will be four basic types). The most commonly used back-cut is the slash type back-cut, beginning from the back side of the trunk cutting forward toward the notch. This type of cut should only be used on trees that slightly lean toward the intended direction of the fall. Be certain that your guide bar will reach all the way across the trunk in one pass (see Illustration #9). The back-cut should be made approximately 2" above the corner of the notch and should always be made as flat as possible (not sloped). Do not cut all the way through, but rather leave an even row of fibers behind the notch to hinge the tree all the way to the ground. Thus we call this uncut section the "HINGE".

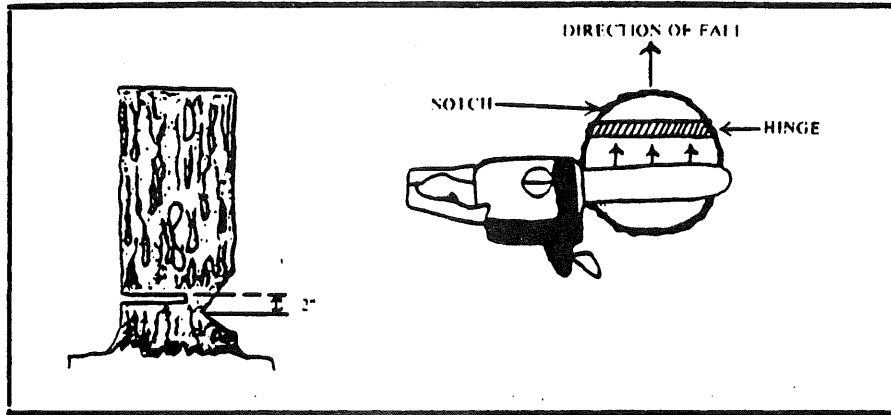


Illustration #9

**WARNING:**

If you intend to fell a heavily leaning tree, do not use the slash type back-cut, for it can be very dangerous. Why? - Because the first fibers to be cut will be the supporting fibers (See Illustration #10).

Once these supporting fibers are severed, the tree will begin to fall (prematurely), and normally, the tree will split up the trunk, and the back side of the tree will snap backward and upward. This is known as "BARBER-CHAIR".

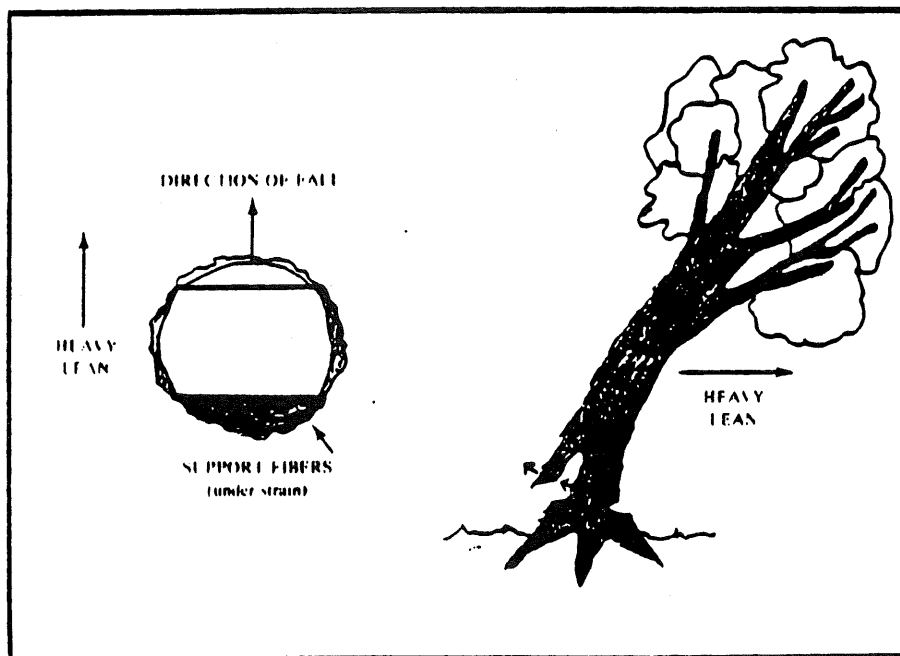


Illustration #10

For heavily leaning trees, you should either use the "bore-cut" type back-cut, or avoid felling the tree.

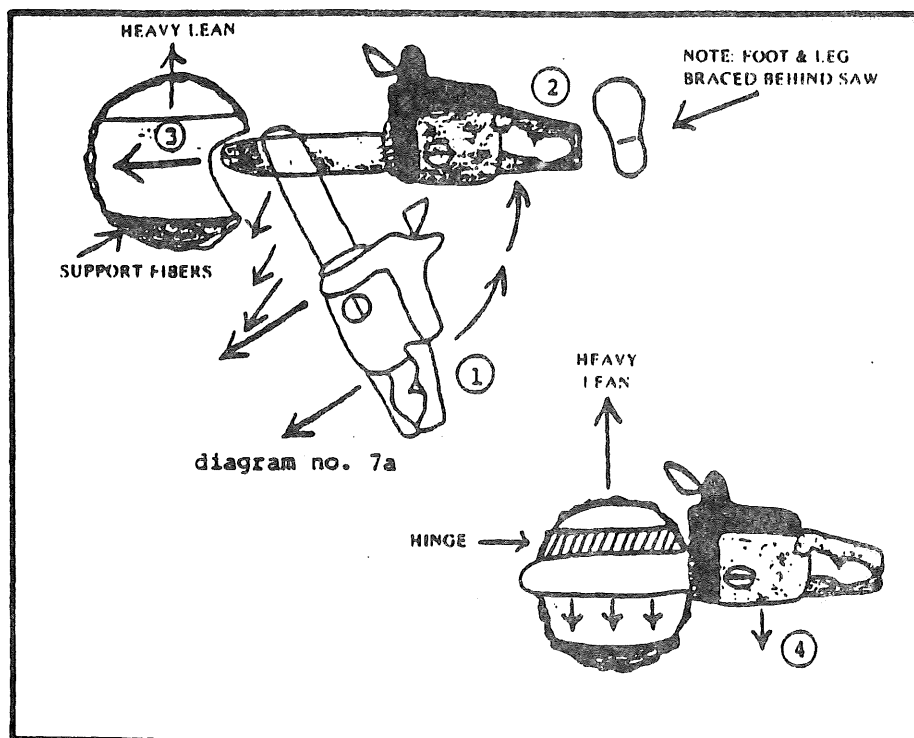


Illustration #11

To begin the bore-cut, start on right hand side of the trunk. Hold the saw flat (or parallel to the ground). Bracing the wrists and forearms into shins will give better control for this cut. Start by drawing into the trunk with the **BOTTOM SIDE OF THE BAR TIP**, creating a clear path for the upper part of the tip to follow (see illustration #11). Avoid letting the upper portion of the tip touch any uncut fibers, otherwise kickback can occur. Once you have drawn into the trunk three or four inches, pivot the saw so that the guide bar is parallel to the back side of the notch. If the saw tries to kick now, it should kick into the hinge wood. However, should the saw begin to push back, out of the cut, release the throttle immediately. Next, continue to plunge the bar straight through the trunk and out the opposite side (see illustration #11). This entire sequence should be done at constant full speed and only with a safety-type chain. Check to see that you have formed an even row of uncut fibers behind the back side of the notch, to make the hinge. If not take the time to form it up now. Once the hinge is formed, begin to saw out toward the back-side of the trunk (see illustration #11). If your guide bar doesn't reach all the way, bore-cut from both sides leaving the supporting fibers for last.

The tree will not begin its fall until the supporting fibers are cut. Once these last fibers are cut, the tree will fall where you intended it to, and with no risk of barber-chair. Remember, when starting the bore-cut, **DO NOT** attempt to spear or stab the bar into the trunk or kickback may occur.

If you are in doubt of which way a tree leans, or if the tree's diameter is greater than your guide bar length, the best back-cut to use would be the "swing bore cut".

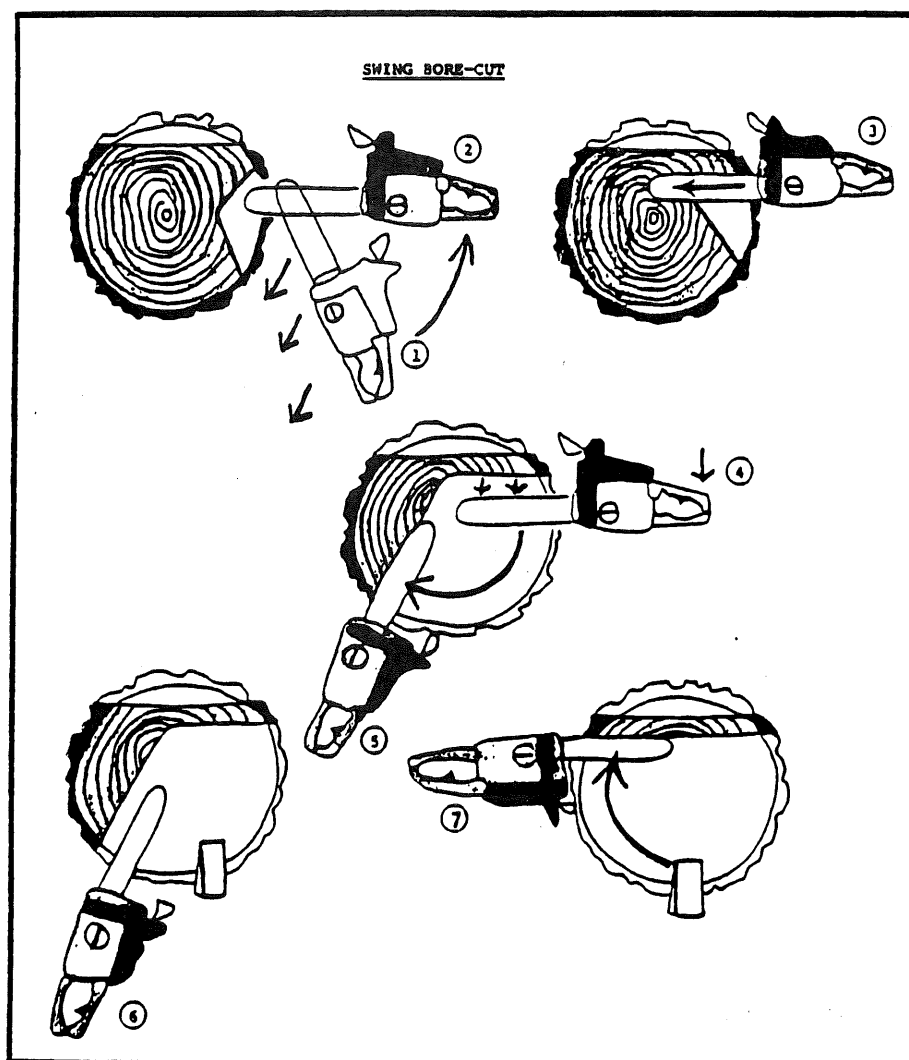


Illustration #12

This cut is begun the same as the regular bore-cut. Once you have drawn into the trunk, with the bottom side of the bar tip, three or four inches and straightened the bar, plunge two-thirds of the way through the trunk. Then proceed to form the hinge on the right side (see illustration #12). Next draw the saw toward the backside of the trunk one or two inches, and then begin to rotate the saw around the trunk in a clockwise rotation. Stop when you have gone two-thirds of the way around the trunk, so that you may set a wedge or pry-bar into the cut.



Once the felling tool is in place, back the saw off the uncut fibers in the trunk, accelerate the saw to full speed, and complete the back-cut leaving an adequate hinge on the left side. Remove the saw from the cut and shut it off. If the tree does not begin to fall, set the saw down and tend to your felling tool. (Never turn your back on a falling tree; instead, watch it fall as you retreat on your escape route.)

#### EXAMINE THE DOWNED TREE

Once the tree is down, you may still have fibers attaching the trunk to the stump. Before cutting them off, check that there is no side-to-side tension in the trunk. Otherwise it may spring at you when you cut it off. If there is tension in the trunk, decide which way the trunk will spring, and cut it off from the opposite side.

Next, be sure there are no SPRING-POLES under the fallen tree. SPRING-POLES are saplings or smaller trees that are bent over by the felled tree. If mistaken for a branch and cut, these SPRING-POLES can whip up and strike the operator. It is best to take note of where they are and avoid them until you have the tree totally limbed out, and then roll the trunk off the saplings (see illustration #13).

If you decide to cut a spring-pole while it is still under tension, do it with extreme care, for it is much like defusing a bomb. (NEVER ATTEMPT TO MAKE A CUT AT THE TOP OF THE SAPLING). Instead, go to where the sapling is rooted into the ground. Next, stand off to one side of the bent sapling (not behind it), and begin a series of slight cuts down the back side of the sapling. Beginning the first cut approximately 18" above the ground, space the cuts 2" apart, making each progressively deeper as you work towards the ground, where you will make the final severing cut. By doing this, you will relieve most of the tension in the sapling before making the final cut. However, it can still snap back, creating a sort of mini barber-chair; so be certain that you are out of the way of a possible snap-back before making any cuts.

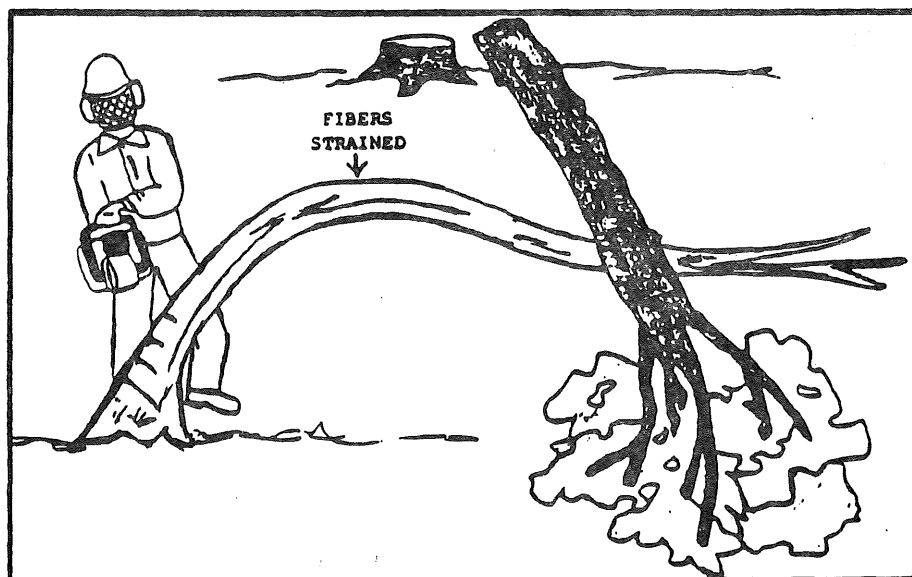


Illustration #13

## DELIMBING THE DOWNED TREE

Eleven basic rules used to avoid pinching of the saw and/or personal injury while delimbing the tree.

1. If on a sloped terrain, always stand on the uphill side of the trunk - otherwise, work on the left hand side of the trunk.
2. Never straddle the trunk. (Stay on one side or the other).
3. Stay with the saw; don't stretch to cut limbs.
4. Only move your feet when the chain is completely stopped, or when the guide bar is on the opposite side of the trunk.
5. To stop the chain after a cut, release the trigger and tap the saw on the trunk before moving your feet or moving a cut-off limb.
6. Accelerate the saw before starting into each limb and never try to change directions in the middle of a cut. Instead, remove the saw and start the cut over again.
7. Rest the saw on the trunk and slide it on the trunk. (You don't have to carry the saw). Rock the saw through each limb, using the trunk as a pivoting point.
8. DO NOT CUT WITH THE TIP OF THE BAR. WATCH THAT IT DOES NOT MAKE CONTACT WITH ANY LIMBS. (A short bar is advantageous here).
9. ALL BRANCHES THAT HANG OUT FROM THE TRUNK SHOULD BE CUT FROM THE TOP SIDE DOWNWARD. (See illustration #14).
10. ALL BRANCHES ON THE GROUND UNDER PRESSURE SHOULD BE CUT FROM THE BOTTOM SIDE UPWARD (See illustration #15).
11. Study each branch before cutting it.

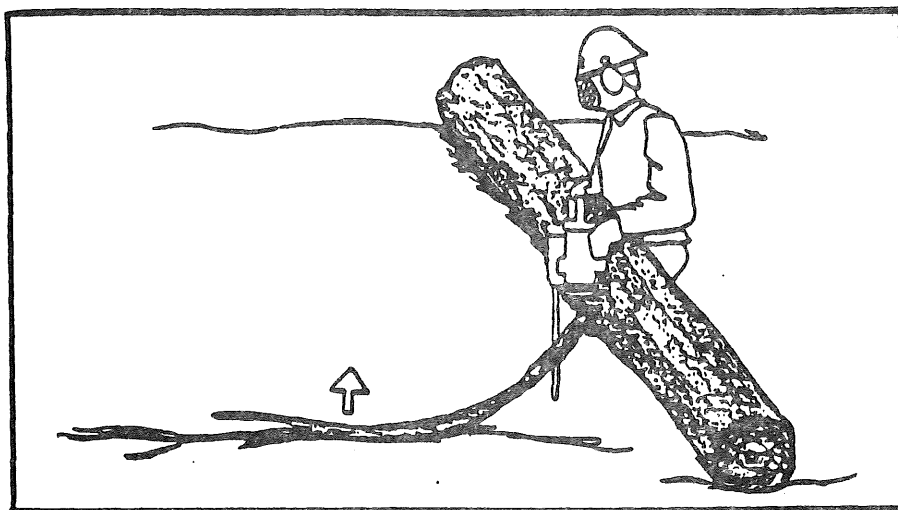
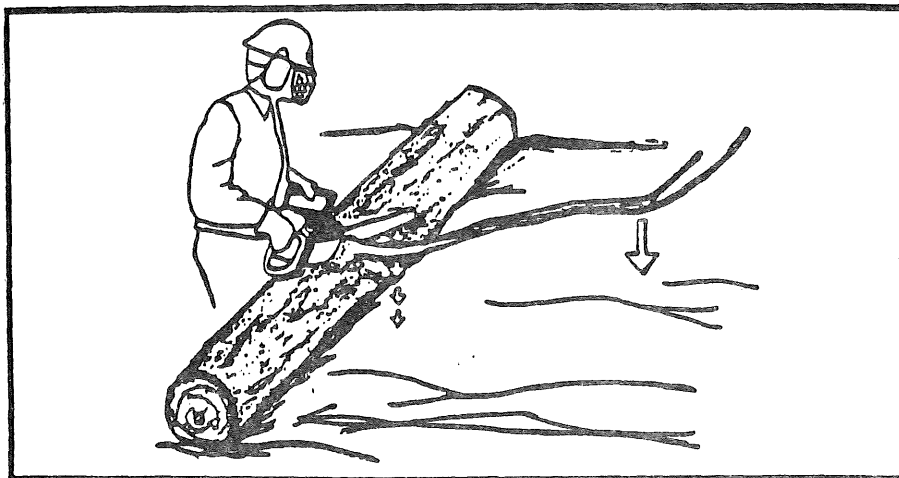


Illustration #14 & #15

### BUCKING UP THE TREE

When bucking up the trunk to desired lengths, there is one basic rule to follow. Look to see where the trunk is supported, and determine which way the two halves will fall apart when cut.

In this situation (See Illustration #16), the trunk extends far beyond each support. If the trunk is bucked in between the two supports, the two halves (at the cut) should fall apart upward. Therefore, if cut from the top downward, the cut should continue to open and you will avoid getting pinched.

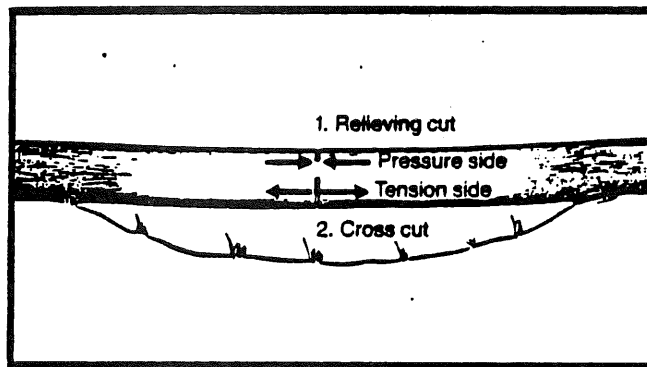
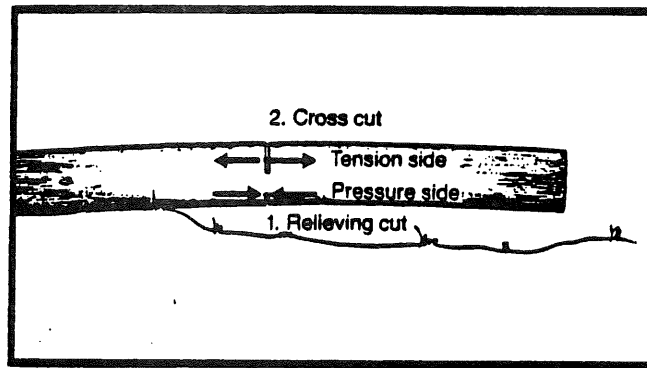


Illustration #16 & #17

If the supports are at each end of the trunk (see diagram #17), the two halves should fall downward; and therefore, the cut should be made from the bottom side upward and again the cut should continue to open avoiding a pinch. If you do get pinched, shut the saw off and avoid tugging on the saw. Instead, try to reopen the closed cut - either by using a pry-pole (an eight foot stick of wood), or by using your own body weight (standing on one end of the trunk).

**CAUTION:** WHEN CUTTING FROM THE UNDERSIDE (UNDERCUTTING) IF THE SAW SHOULD GET PINCHED, IT MAY PUSH BACKWARD OUT OF THE CUT. IF THIS HAPPENS, RELEASE THE TRIGGER IMMEDIATELY - OR KICKBACK MAY OCCUR.

