

# CHAINSAW 101

CHAIN SAW USE  
SAFETY TRAINNING

Clark County Sheriff Core Comp Rev. # 2014-1  
Chainsaw Safety

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## INTRODUCTION

- "A chain saw is the most dangerous hand tool that can be purchased on the open market. It requires no license and no training to own or operate. Approximately 40,000 injuries and deaths were reported last year in the United States...and most could have been prevented."
- "If you place your hands on a chain saw, you must keep in mind that it is like grabbing a hand grenade without a pin in it. It is very likely to go off in your face. From the moment that you take it out of storage to the time that it goes back to the same place, you can be hurt by either it, or by whatever you will be cutting."

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## GOAL AND OBJECTIVES

- GOALS**  
This program is designed to provide information and procedures that will reduce the possibility of injury from chainsaw accidents when operating a chainsaw for bucking and felling saplings and other vegetation to facilitate transit in forested conditions.
- OBJECTIVES**
  - List the common causes of chainsaw accidents;
  - List the protective equipment necessary when using a chainsaw;
  - Describe general chainsaw considerations;
  - Explain how chainsaw kickback occurs and how to prevent it;
- There will be a practical chainsaw practice session in the field for trainees on the skills and techniques portion of this class. The field session will cover:
  - Chainsaw care and maintenance;
  - Bucking under different types of tree stress conditions;
  - Summer tool requirements and weather related shutdown restrictions.

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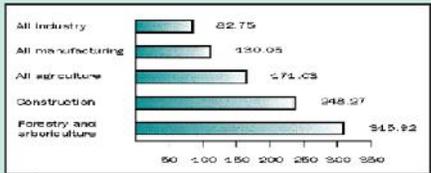
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## STATISTICS

Average fatal and major injury rates per 100 000 employees (1990/91 - 1995/96)




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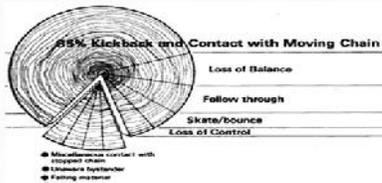
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## STATISTICS



- Do you know approximately what percentage of all woods accidents in a year are typically the result of a chain saw cut?  
**30 Percent**
- Do you know how fast a chain saw blade can move at full throttle?  
**45 MPH**
- Do you know which age group of operators are at the greatest risk for injury?  
**Younger Operators**
- Do you know how many of all chain saw accidents could be prevented?  
**Almost all of them**

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## STATISTICS

- $315 \times 30\% = 94$  Fatal injuries year on average for forestry and arborist.
- $94 \times 85\% = 80$  Fatal injuries due to kickback.

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## ACCIDENT COMPONENTS

- **Human, Agent, Environment**
- The **human** component refers to both the physical and mental condition of the operator. Operating a chainsaw calls for recognizing any personal limitations, including fatigue and boredom, which can reduce reaction time and increase the odds of an accident occurring.
- Although the chainsaw itself is the **agent** that inflicts most common injuries, accidents also result from trees or dead limbs and from loss of balance, which can lead to serious falls.
- **Environment** is the third accident component. Changing and often severe weather conditions can also increase the likelihood of an accident.

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## THE CHAINSAW

### What Saw Should You Choose?

The best saw for you is the one you can comfortably handle and is appropriate for the type of work you do most often.

Lightweight saws	good for occasional user: cutting limbs, firewood and small trees
Midweight saws	better for more frequent use
Heavyweight saws	for PROFESSIONAL use only

There are also many safety features you should look for -- NOTE that these features do not prevent accidents, they only reduce the risk to you.

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## Kickback Zone



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## THE CHAINSAW

- Your saw should be fitted with:
- a clearly marked positive on/off switch
- chain brake incorporating a front hand guard
- safety (dead hand) throttle
- chain catcher
- rear hand guard
- anti vibration system
- exhaust system to direct fumes away from the operator
- chain cover for transportation and
- an adequate tool kit for corrective and preventative maintenance

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## THE CHAINSAW

### Chain catcher

On the bottom of the saw is the chain catcher, which catches the chain if it breaks or detaches. (6)

### Throttle lock

On the inside of the rear handle is the throttle control. To prevent accidental throttle advance, when you squeeze the throttle control you must also depress the throttle lock on the top of the handle. (7)

### Stop control

With the easy-access stop control you can stop the engine quickly. (8)



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## MAINTENANCE

- Always read operators manual of the chainsaw model you are operating. Become familiar with the capabilities of the tool and the maintenance needs for proper and safe use.
- Most of the field maintenance is for the chain bar and some components of the engine such as spark plug, air filter, sprockets, etc. Failures from the main body of the machine must be maintained in a shop.
- Do not use a saw that appears to be malfunctioning due to failures in the main body of the machine it may lead to accidents.

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## MAINTENANCE

- Daily examination to ensure that the saw is operating efficiently helps reduce the prospect of an accident.
- Taking care of the chain is the most important, most often neglected, and most difficult feature of a daily operation check. **Sharpening** techniques can be varied with good results. However, it is important to use the proper technique for specific types of chain. Consult your owner's manual to determine the proper size file and tooth angles.
- Proper **chain tension** contributes to efficient cutting and longer chain life and lessens the chance of the chain jumping the bar. For a hard-nosed bar, the proper tension should result in  $1/16'$  to  $1/8'$  of space between the bottom of the bar and the tie straps between the teeth. Tension for a bar with a roller or sprocket nose should be slightly tighter without binding when the chain is pulled around the bar with a gloved hand.
- **Chain lubrication** is provided by a mechanism in the saw housing. Whenever the chain is off the bar, examine the oil port and clean it if necessary to keep the chain running coolly and efficiently. A well-lubricated chain is also less likely to jump from the bar and injure the operator.
- Access to the **air cleaner** is usually provided by a thumbnut on the top of the housing. The element should be cleaned by brushing or tapping it to clear out small collected debris. Never use gasoline or other solvent because flammable residue could explode if ignited by the muffler or electrical system.
- The **idle and/or clutch adjustment** must be set in such a way that the chain does not turn when the engine idles.

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## MAINTENANCE

- **Winter Chain Saw Use Guidelines**
- **cutters:** Keep cutters sharp. Touch up every hour, more often if needed. Do not force dull chain to cut.
- **depth gauges:** Check and adjust your cutter's depth gauges at every sharpening. It is not uncommon for top-plate breakage to occur with low depth gauges in conjunction with frozen wood.
- **bar:** Keep the bar groove clean and the oil hole open. Turn bars over to equalize rail wear. Chain and bar wear will occur if oil is not allowed to pass freely from the saw.
- **drive sprocket:** Replace the sprocket after every two chains, or sooner. Chain stretch is often the outcome if too many chains are allowed to run on a worn sprocket.
- **tension:** Keep your chain correctly tensioned. Check and adjust often. Loose chain tension is a very common reason for premature chain and bar wear.
- **oil:** Use lightweight bar-chain oil and be certain your chain is receiving oil from the saw. If needed, you can dilute your summer oil with up to 25 percent of clean kerosene or diesel oil. You should use up to twice as much of this diluted oil during operation. Because they are friendlier to the environment, biodegradable lubricants are suggested as an alternative to traditional mineral-based oils.  
When cutting in snow, clear as much as you can away from the cut. Snow will melt from the heat of your chain and bar, which will wash away the oil.

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## FIELD MAINTENANCE

- When using a chainsaw for extensive cutting, always have nearby:
- a supply of ready-mixed two-stroke fuel;
- bar oil;
- tools for tightening the chain (screnches) - or removing the drive sprocket outer casing to clean out debris - or re-seat the chain should it dislodge;
- cloth or absorbent material to wipe any spilt fuel or oil from the chainsaw after refueling;
- a file and file guide for sharpening the chain after every refuel;
- some sort of portable vice to grip the chain bar during sharpening; and
- a small brush to regularly clean the air filter and around the chain



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## FUELING AND OILING

- **Fire Prevention**
- Gasoline and the hot chain saw engine can be contributing factors in starting fires in the woods. You should take precautions to prevent fires.
- There are five very important rules to remember:
- 1. **NEVER fuel a saw while the engine is running.**
- 2. **NEVER fuel a hot saw.**
- 3. **NEVER smoke or have any type of flame while you are around a saw or during fueling.**
- 4. **NEVER start the saw where you fueled the engine.**
- 5. **Keep leaves and dry materials away from the hot muffler.**

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## PERSONAL PROTECTIVE EQUIPMENT



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### Personal Protective Equipment



- The basic piece of personal protective gear is an approved **hardhat**. There are many hardhats available with attached **ear muffs**, necessary to cut the noise, and a screen-shield, which gives **eye protection** from flying debris (figure 4).
- Inexpensive ear plugs are also effective for protection from high noise levels. It's important to fit them tightly into the ear canal. Safety-glass eyewear can also substitute for a screen-shield, although lack of air circulation behind the lenses frequently causes fogging during exertion.
- Other protective gear should include sturdy **work boots**, **leather gloves**, and **leg chaps**. Be sure that the chaps are constructed of material designed for protection from chainsaws. Two materials commonly used, ballistic nylon and Kevlar, are designed to slow or stop the chain if it strikes your leg, allowing you slightly more reaction time.

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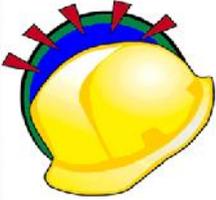
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### Head Protection



Hard hats must be worn when overhead hazards are present. The hard hats must comply with ANSI standards (Subpart I, ANSI Z89.1-1986, if purchased after July 5, 1994, or ANSI Z89.1-1969 if purchased before July 5, 1994). Check for an ANSI label inside the hat.

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### Hearing Protection



Requirements for hearing protection are found in 1910.95. Particular attention should be paid to monitoring the chainsaw operation to determine the noise levels employees are exposed to. This will determine whether the employer is required to implement a hearing conservation program. Some basic elements of a hearing conservation plan are providing audiograms, training employees, and providing hearing protection in a variety of forms at no cost to the employee.

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### Eye/Face Protection



Eye and face protection must be worn where there is potential for injury to the eyes or face. The protective equipment must comply with ANSI standards (Subpart I, ANSI Z87.1-1989 if purchased after July 5, 1994, or ANSI Z87.1-1968 if purchased before July 5, 1994).

Logger type mesh screens are considered to be adequate eye and face protection for chain saw operators.

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### Leg Protection



Each employee who operates a chain saw must wear leg protection constructed with cut-resistant material. The leg protection must extend from the upper thigh down to the boot top and adequately cover the leg.

- Leg protection is available in a variety of forms, including chaps, logger pants, and leggings. The protective material also comes in a variety of forms including ballistic nylon, polyester, Kevlar, Engtek, etc.
- Underwriters Laboratories (UL) currently tests and labels leg protection which meets minimum cut resistance requirements. (Reference ASTM F1414-92a)

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### Foot Protection



Employers must assure that each employee wears heavy duty logging boots that are waterproof or water repellant, and cover and provide support to the ankle. If the employee uses a chain saw, the footwear must be constructed with cut-resistant material that will protect against contact with a running chain saw. Calk soled boots are acceptable when they are required for the employee's job.

- Underwriters Laboratories (UL) currently tests and labels foot protection which meets minimum cut resistance requirements. (Reference ASTM F1818-97)

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## OPERATING THE CHAINSAW

- **Checking the Chain:**
  - If the chain isn't new it is probably a good idea to file it, since cutting is both easier and safer when the chain is sharp.
  - Also make sure the chain is tensioned properly.
  - A new chain should be re-tensioned after operating the saw for a short period.



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## OPERATING THE CHAINSAW

### Fuel

When filling the saw with fuel and chain oil, place the saw on a stable surface. To reduce dangerous emissions, choose environmental petrol and vegetable-based chain oil. The overflow protection helps you avoid unnecessary spillage (3). And considering the risk of fires, you should always move the saw before starting it.



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## OPERATING THE CHAINSAW

- When you're ready to start, place the saw flat on the ground and clear the area around the bar.
- Activate the chain brake by pushing the kickback protection forward to prevent the chain from rotating once the saw starts.
- If the saw is cold, set the choke on full and set the throttle lock button to half throttle.
- Put your right foot partway through the handle and hold the front handle firmly with your left hand. Pull the starter handle with your right hand until the saw tries to start (4).
- Now place the choke to the half choke position and lock the throttle trigger to the half way position. Pull the starter handle until the saw starts.
- Depress the throttle once to drop the engine speed to an idle.
- If the engine is already warm, don't use the choke or throttle lock, but follow the other steps as shown above.



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## OPERATING A CHAINSAW

If the saw is difficult to start despite being warm, pull out the choke like you do during cold starts, but push it back in right away. When you've got the saw started, don't disengage the chain brake until you're ready to saw.



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## OPERATING A CHAINSAW

### Checking the chain brake

Now check that the chain brake works. Place the saw on a stable surface and squeeze the throttle. Activate the chain brake by pushing your left wrist against the kickback protection, without releasing the handle. The chain should stop straight away. (5)



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## OPERATING A CHAINSAW

### Does chain lubrication work?

Also check the chain lubrication. Hold the saw above a light surface, such as a stump, and hit the throttle. A line of oil should be visible on the surface. (6)



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## OPERATING A CHAINSAW

### How to operate the saw

There are some basic rules for using a chainsaw. Hold it firmly by both handles and hold your thumbs and fingers right around the handles. Make sure you hold your left thumb under the front handle, to reduce the force of a possible kickback.



### Good balance

It's good to have respect for the saw, but don't be afraid of it. If you hold it close to your body it won't feel as heavy. Also, you'll be more balanced and in better control of the saw. For the best balance, stand with your feet apart. (7)

## OPERATING A CHAINSAW

### Moving around

When moving around the worksite, make sure the chain is not rotating by activating the chain brake or turning off the engine. For longer distances, use the bar guard. (8)



## OPERATING A CHAINSAW

### You're trying to get some work done and the chainsaw is acting funny; here's what to do when:

**Chain won't turn; check for:** - Tension too tight - Burred drive links - Pinched bar groove - Chain off sprocket - Bar sprocket nose frozen - Chain brake engaged - Adequate bar/chain lubricant - Debris (chips) in bar groove or drive sprocket

**Slow cutting; check for:** - Dull cutters - Depth gauges too high - Clutch slipping - Bar groove too wide - And, believe it or not, chain on backwards

**Chain cuts crooked; check for:** - Low depth gauges on one side - Uneven bar rails - Cutters filed differently, one side to the other - Damage to cutters on one side of chain from hitting the ground, a rock, or other foreign material

When your chainsaw won't start... here's what we always check :- Ignition switch on - choke on - Air filter clean - Spark plug clean, gapped - Plug wire on - Saw gas in fuel tank

**Chain won't turn? Check to make sure the chain tension is set correctly. The front of your chain's cutters should always face and drive towards the tip of your bar.**

## FELLING

Felling a tree is something that requires thought and planning. If you're not experienced, you should have someone with you who is. Work calmly and carefully.

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## FELLING

- This training is not oriented towards felling trees.
- Felling operations of this training is limited to saplings and shrubs that need clearing for transit through logging roads and areas of blow down that require limbing and crosscutting or to clear areas such as helicopter landings.
- Felling larger trees must be done by trained, experienced employees and professionals.
- If you are interested in becoming trained in felling trees and more specialized tree work you must seek information about the S-212 of the fire program and other training provided by Professional Logger Associations or private contractors such as The Technical Services Department of Oregon Cutting Systems.

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## LIMBING AND CROSSCUTTING

The best working height is when the trunk is at hip height. Stand on the left of the trunk and work from the base of the tree upwards. Stand firmly with your feet apart and keep the saw close to your body. Work with both a pulling and a pushing chain and always try to rest the saw on the trunk or against your hip. Only move when you have the trunk between yourself and the bar of the saw (1). Branches on the upper side of the trunk can be cut with the saw lying on its side (2). You can limb the branches on the underside of the trunk at the same time as the rest if you have a good working height. Observe how the branches are tensioned, so you can see them from the correct side, otherwise, there is a risk that the saw will get caught. If the tree is lying right on the ground, you'll have to wait until the branches on the bottom are finished with the others and can roll the trunk over. Be careful when the trunk is close to the ground, since there is quite a risk that you'll smack something with the tip of the bar, which will cause a kickback.

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## LIMBING AND CROSSCUTTING

**Limbing large branches**  
If the tree has thick branches, you should first remove other branches that are in the way. Since thick branches can be under

great tension, limb them in stages from the end, in towards the trunk.  
Saw with the bar held vertically, to reduce the risk of it getting caught. If the branch is very thick, you might have to cut it from two sides. (3)




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## LIMBING AND CROSSCUTTING

**Crosscutting**  
Study the tree and your surroundings before you start, especially if the trunk is thick. First, try to see how it is tensioned. Watch how the trunk reacts when you start to saw. You might have misjudged the tension.  
Stand off to the side of the cut, since the trunk can jump up when it comes apart. Never stand below the trunk if the ground is sloping.

**Pressure on the top**  
If the trunk lies so that the pressure comes from above, start with a cut from above. Saw about one-third of the way through the trunk or until it starts to pinch the bar (4a).  
Then cut from underneath, to meet the first cut (4b).




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## LIMBING AND CROSSCUTTING

**Pressure on the bottom**  
If it lies so that the pressure comes from below, you work the other way around. Start by sawing from underneath, about one-third of the way through the trunk or until it starts to pinch the bar (5a). Then cut from above, to meet the first cut (5b).

**If the saw gets stuck**  
If the bar gets stuck, don't try to pull out the saw. Instead, stop the engine and bend open the trunk until the saw comes loose. (6)





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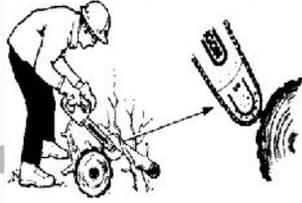
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## LIMBING AND CROSSCUTTING

Kickback may occur when the moving chain at the nose or tip of the guide bar touches an object, or when the wood closes in and pinches the saw chain in the cut. Tip or bar nose contact can, in some cases, cause a lightning-fast reverse reaction, kicking the guide bar up and back toward the operator. Pinching the cutting chain along the top of the guide bar may push the guide bar rapidly toward the operator. Either of these reactions may cause you to lose control of the saw, which could result in serious personal injury to yourself or to bystanders.



The top of the tip of the chainsaw guide bar is known as the KICKBACK DANGER ZONE. When contact is made with an object such as a branch or a log, there is a danger of a sudden bar nose kickback reaction.

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## LIMBING AND CROSSCUTTING

- **Avoiding Kickback**
  - To avoid kickback:
    - Be constantly aware of the position of the upper quadrant of the blade tip. (This is the part that triggers a kickback when it hits resistance.)
    - Never engage the upper quadrant of the guide bar with whatever you are cutting and avoid contact with any hidden branches or obstructions. Ensure there is a clear work area.
    - Always clear away brush, vegetation and any obstructing debris before attempting a cut that might trigger a kickback.
    - Avoid cuts that will cause the chainsaw to jam in a tree trunk or limb.
  - Avoid jamming
    - To avoid jamming the saw:
      - Always cut into the compression wood first until the cut starts to close;
      - Always make the compression cut beneath if the log or limb is suspended from one end, (and on top if it is supported at both ends);
      - Cut from the other side towards the compression cut.
    - Make a habit of using a wedge to prevent the compression cut jamming tight on the chainsaw blade.
  - Safety Controls
    - To maintain safety control:
      - Hold the chainsaw firmly, making sure the left hand encircles the top handle squarely, with the thumb underneath.
      - Ensure the chainsaw is fitted with a chain brake - preferably inertia activated.
      - Always set the depth gauge in accordance with manufacturers' recommendations (refer to operator's manual).

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## LIMBING AND CROSSCUTTING

- **What's The Big Deal About Kickback?**
- Kickback is one of the greatest saw hazards. It occurs when a force throws the saw rapidly and sometimes uncontrollably towards you. It is a very violent and sudden motion which can severely or fatally injure you. There are several causes:
  - an abrupt change in wood character -- hitting a knot or a nail
  - striking a nearby limb with the tip of the moving chain while cutting
  - running the chain too slowly
  - twisting the saw in your cut so the chain grabs
  - using a dull or loose chain
  - having a loose grip on the saw or cutting with only one hand
  - not paying attention



This young worker was lucky not to sever an artery when his chainsaw kicked back.

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## PRACTICAL TRAINING

- We would like to have a chainsaw per every two participants for the maintenance. They could bring their own personal saws for this if more saws are needed. They should bring correct saw file and bar wrench tool for the saw. These tools can be supplied but an accurate equipment list must be provided.
- Classroom or shop area is needed for one to two hours of the program if weather is undesirable.
- The following materials are needed for the training:
  - 2ea 10' x 16" log (clean if possible) (any species)
  - 1ea per participant 4' x 16"-20" (any species)
  - 1ea per participant red alder, big leaf maple or other bend-able saplings, (3'-4' at base 25' tall/long [ this is not mandatory but better illustrates pressures] )
- All wood should be not be dried. As "green" as possible.

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## STORING THE CHAINSAW

- **Maintenance After Use**
- After completing chainsaw work, always:
  - reverse the chain bar, top to bottom, to avoid wear on one side;
  - clean out the groove on the chain bar;
  - clean the chainsaw, particularly the air filter, cooling inlets and inside the sprocket cover; and
  - clean the chain brake mechanism.
- Have your chainsaw serviced regularly- say once every six months.

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