

Fallers' & Buckers' Handbook

**Practical methods for falling
and bucking timber safely**



WorkSafe™



**WORKERS'
COMPENSATION
BOARD**
OF BRITISH
COLUMBIA

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About the WCB

Preventing on-the-job injury and disease is the first priority of the Workers' Compensation Board (WCB) of British Columbia. WCB officers inspect worksites in B.C. to make sure they comply with the Occupational Health and Safety Regulation, which sets out minimum workplace standards for health and safety. The WCB also investigates serious workplace accidents and consults with employers, supervisors, and workers to promote health and safety in the workplace.

Under the requirements of the *Workers Compensation Act*, a worker must report an injury or a disabling occupational disease as soon as possible to the employer. The employer must report work-related injuries, occupational diseases, and work-related deaths to the WCB within three days. A worker may not make an agreement with the employer to give up WCB benefits.

If a worker suffers a work-related injury or illness, the WCB provides fair compensation that may include medical costs, loss of earnings, physical rehabilitation, and pensions. The WCB also works with employers to help injured workers return to work. If a worker is killed on the job, counselling and financial help are made available to the victim's family. For more information on requirements or eligibility for WCB coverage, contact the WCB office nearest you.

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To report after-hours and weekend accidents and emergencies, call 604 273-7711 in the Lower Mainland, or call 1 866 922-4357 (WCB-HELP) toll-free in British Columbia.

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FOREWORD

This book is written for professional fallers and buckers. It describes safe falling and bucking techniques used in the coastal and interior forests of British Columbia. All practices described are based on actual experience.

This book is not a substitute for an experienced trainer or good company safety procedures. It's meant to be used in conjunction with these.

Safety in the woods begins with you. Learn safe falling and bucking techniques. Follow your company's written safe work procedures and WCB requirements.

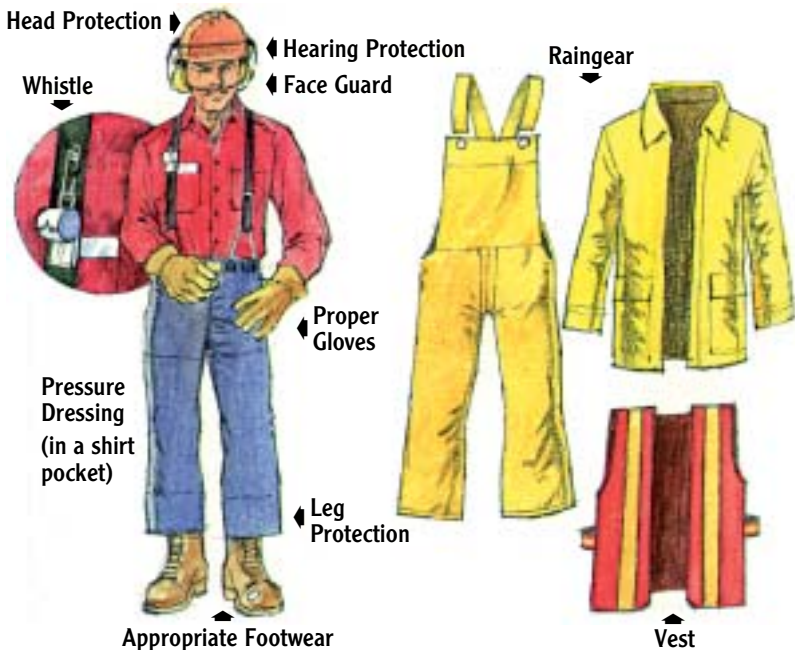
PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

Safety Headwear

Hard hats must be worn to protect against head injuries from falling, flying or thrown objects. The hard hat should be in good condition. If it's cracked or deeply scratched, replace it. The head harness, or suspension, inside the hat should be adjusted for proper fit. The hard hat must be high-visibility orange or red and CSA-approved.

High Visibility Clothing

Fallers and buckers must wear brightly coloured clothing that contrasts with the environment when their location must be routinely checked. The front and back of clothing must have fluorescent trim for daytime use and retroreflective trim for nighttime use. Distinguishing clothing such as shirts, suspenders, and rainjackets are suitable. When working around moving vehicles and equipment, workers must wear hi-vis clothing that meets WCB standard PPE #2, Type 3.



Hearing Protection

Fallers and buckers must wear hearing protection. There are several types of ear plugs and ear muffs currently available. If kept in good condition and worn properly, either will protect against harmful noise, without depriving workers of useful hearing on the job.

Eye Protection

Fallers and buckers must wear eye protectors to prevent eye injury from flying sawdust and chips when falling, limbing, bucking or brushing-out. The eye protector can be fastened and hinged on the hard hat or carried, ready for use. Some workers use face shields of plastic or fine wire mesh, while others prefer prescription safety glasses.

Leg Protection

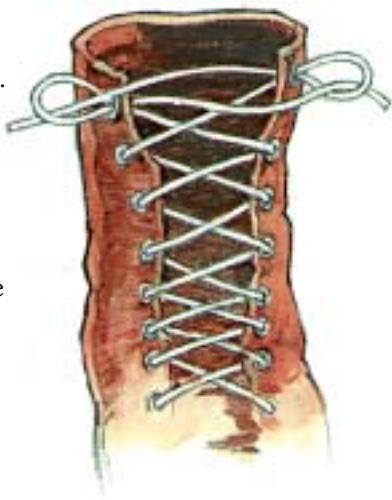
Leg protection that meets WCB standard PPE #1 is mandatory for chainsaw operators. In cases of saw kickback, protective pants can prevent serious injury. Padding that extends from the top of the pants to 50 - 70 mm (2 - 3 in.) above the bottom of the pants will give the best protection.

Safety Footwear

All fallers and buckers who walk on logs must wear caulked footwear. Mud, snow, ice, uneven and broken ground or awkward work positions increase the risk of falling or slipping.

A variety of caulked footwear is available. Rubber or composition soles with screw-in type caulks are well suited to snow conditions. Leather soles with drive-in type caulks are better for dry weather. The screw-in type caulks are the most widely used.

Footwear must give firm support, particularly at the ankle. To prevent laces from releasing, use the “Logger’s Tie.”



The Logger's Tie

Suspenders

To allow for freedom of movement, the waistband and legs of the faller's staged pants should be kept loose. Suspenders will keep the pants in a comfortable position even when rain-soaked. Clothing and rain gear should be kept in good condition.

Hand Protection

Where work practices may injure the hands, fallers and buckers must wear gloves to protect them against abrasions, splinters, chain-filing cuts, Devil's Club, flying chips, and cold. Select gloves that offer the best protection required. Gloves with ballistic nylon backing are designed to protect against saw cuts.

Anti-vibration gloves are available to reduce mid and high frequency vibrations that can cause circulatory problems in the fingers. Some workers have found these to be effective when using chainsaws. Look for gloves that meet ISO standard 10819 and include full finger and thumb liners. The liner must be relatively thin so that the chainsaw can be comfortably held without needing extra grip force. Gloves that meet the ISO standard and that have vibration-dampening liners made of a gel material or air sacs are available.

First Aid

Carry a well-packaged pressure bandage where it is easily accessible (in a buttoned shirt pocket). Tucking it in the hard hat is not recommended. In some injuries the hard hat was knocked off and the worker was unable to reach it.

Communications

Each faller must carry a whistle, a two-way radio, or other means to call for help. Whichever device is used, it should be kept readily accessible and checked regularly. The whistle is the easiest and most commonly used device to call for help.

The Power Chainsaw

There are many brands of chainsaws. Most saws used in the forest industry have gas-powered, two-cycle motors. Some older models have gear drives, but modern saws are direct drive, utilizing a centrifugal clutch. They can weigh up to 27 kg (60 lb.) or more, and can be fitted with guide-bars up to 1.3 m (50 in.) long.

Chainsaws have become lighter, faster and more powerful. The power to weight ratio is higher, increasing the hazards to users and making the reduction of noise and vibration more difficult.

Three main hazards are associated with chainsaw use:

- Cuts
- Noise
- Vibration

Noise

When the ear is exposed to high levels of noise, like those produced by a chainsaw, hearing loss occurs. The loss is permanent and worsens over time. Noise-induced hearing loss is easily preventable. Wear your hearing protection! Well-fitting ear plugs or muffs will prevent hearing loss.

Vibration

Over time, vibrations produced by the chainsaw can cause circulatory problems in your fingers. This can lead to a condition called Vibration White Finger Disease (Raynards Syndrome), in which the fingers turn white and lose their feeling when exposed to cold or to vibration from the saw.

To reduce the likelihood of developing this condition:

1. Maintain your saw's vibration dampening (rubber bushings between the handle and the engine section) in good condition.
2. Keep the chain properly filed.
3. Don't hold the saw so tightly that your hands cramp.
4. Keep hands warm by wearing gloves.
5. Consider the use of anti-vibration gloves (see "Hand Protection" on page 5).

Cuts

Cuts are the most common type of injury caused by chainsaws. They can range from minor hand injuries, while filing the chain, to major amputations from saw “kickback.” Select a chainsaw that meets CSA standard Z62.1-95.

Cuts can occur if you slip or fall and accidentally touch the chain. The most serious cuts are caused by kickbacks. A saw can kick back with surprising force in less than a second. There is no time to react and, if you're poorly positioned, the resulting injuries can be severe. A chainsaw cut, unlike the smooth slicing of a knife cut, results in torn and gouged flesh with chain oil and dirt in the wound. Some kickbacks have resulted in permanent disabilities to fallers. On occasion, an entire arm or leg has been severed when the worker lost control of the saw.

Statistically, your “off-side” is most likely to be injured by the saw. For example, if you're right-handed, your left arm and left leg are more at risk and vice versa.

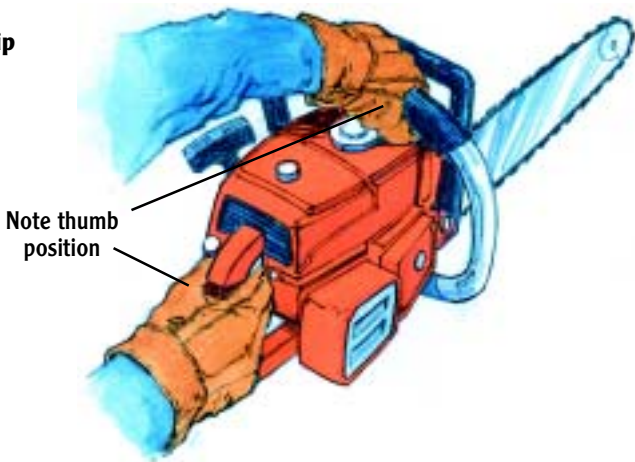
Guidelines for Safe Chainsaw Use

- Keep the saw chain properly filed and snug on the bar.
- Ensure the rakers, or depth gauges, are properly filed to minimize kickbacks.
- Adjust your saw so that, when idling, the chain is stopped.
- Keep the chain brake in good working order. Do not use the saw if the chain brake is defective or missing.
- Wear gloves while working and when filing up, handling or changing the chain.
- Wear boots with good sole grips – caulks where necessary.
- Wear leg protective devices.
- When carrying the saw, keep the chain bar to the rear. If you stumble, you won't fall on the chain. Also, the dogs and chain won't hang up in brush.
- Do not use the saw if the trigger safety lock is defective or missing.
- Shut the motor off when carrying the saw any distance.
- Don't work off-balance or with poor footing.
- Learn to use the saw equally well, right or left-handed, to avoid working in awkward positions.
- Maintain a firm, but not tense, grip with both hands on the saw.

- Keep your thumb under the handle bar of the saw. This will stop the hand from slipping onto the chain in cases of kickback.
- When pulling the saw out of cuts, or re-positioning, do it smoothly.
- Don't jerk the saw. Jerking the saw can cause loss of control, uncertain footing and possible back, arm or shoulder strain.
- Start a wedge in the backcut as soon as possible. It will act as a guard if the saw kicks back, and prevent the tree from sitting back.
- Remember, the tip of the bar causes most kickbacks. Know where the tip of the bar is at all times, especially when working in large timber or when limbing.
- Use the right length bar for the job.
- Hold the saw firmly against your body when using it in the boring position with a slight twist in the bar. This will reduce the possibility of an uncontrolled kickback.
- Don't bore unnecessarily.
- Never stand directly behind the saw or straddle the saw. Work to one side to minimize injury from kickbacks.
- The chain brake should be activated often during the day to ensure that the brake is effective. Clean out the mechanism of the chain brake daily.

With the exception of chain brakes, chainsaws contain few mechanical safeguards. For safe operation, you must develop good saw handling skills.

Proper Grip



Guidelines for Chainsaw Maintenance

Proper maintenance takes little time, but will extend the life of the saw and make your work easier.

It's good practice to check over your saw at the end of the day when you have time to take care of any problems with the saw. Here is a daily maintenance schedule that applies to all makes of chainsaws:

- Read the manuals and specifications for your saw. Use the fuel mixture and lubricating oil recommended by the saw manufacturer.
- Clean off the saw.
- Do a quick check for loose bolts, missing screws, broken castings, etc.
- Clean the air filter.
- Fill with fuel and oil.
- File up if necessary.
- Check the bar for burrs and remove them with a flat file.
- Grease the tip.
- Check the floating sprocket for signs of wear at least once a week. Replace if necessary.
- Keep the chain brake clean.
- Ensure the trigger safety lock is functioning properly.
- Do not fuel the chainsaw on top of a truck's plastic box liner, as static electricity may build up causing an explosion or fire.

Felling and bucking are difficult jobs. Equipment problems only add to the difficulty. Preventive maintenance, like the steps outlined above, will not only prolong the life of your saw, it will have a positive effect on your attitude as you start the work day. If your saw is well maintained, if it's ready to go, starts easily and runs smoothly, your work day will probably go better as well.

Fuelling Your Chainsaw



- Allow hot saw to cool two or three minutes before refuelling



- Refuel saw only on a spot cleared to bare ground



- After refuelling, tighten the tank cap to prevent fuel spilling onto clothing



- Clean spilled fuel from motor before starting



- Move saw at least 3 m (10 ft.) from refuelling spot before starting



- Check fuel lines, tank cap and connections for leaks



- Keep outside surface of saw clean of oil and sawdust



- If saw requires mechanical adjustment, set it on a stump or bare ground



- Don't operate saw if it's backfiring



- Store fuel in approved containers

NO!



- No smoking at any fuelling point or after spilling fuel



- Have a fire extinguisher close by

Other Tools

Axe

The single-bitted axe is used by fallers for cutting, brushing-out, driving wedges and as a plumb to determine lean. The axe head must be kept sharp and free of burrs. The handle must be tightly set into the head and free of splits. The axe head should be pinned to the handle.

In large timber, the axe head should be 1 - 1.5 kg (2.5 - 3.5 lb.) or more. This makes driving wedges easier, with less shock to the arms and shoulders. The axe head should be wide and square enough to make good contact with the wedges. The axe must be within easy reach at all times. It should be kept at the base of the tree being felled.

Do not carry the axe stuck in the back of your belt. Serious injury could result if you fall or are struck on the back. If worn on the belt, a proper holster should be used. A “hi-vis” handle is desirable.

Wedge

Wedges are used in falling to prevent the tree from settling back on the stump. They're also used to force trees into a lay and to hold trees if a “pusher” tree is to be used. Wedges are used in bucking to prevent a log from pinching or dropping. Wedges come in various sizes and are usually made of nylon or other plastic.

Wedges should be checked before use to make sure they have no hairline cracks or other damage. Wedges must have the burrs cut off before use to prevent eye injury. Use caution when wedging timber. When wedging frozen timber, rough-up the wedge sides. A faller must not attempt to fall any tree unless suitable wedging tools are available.

Belt and Pouch

A belt and pouch should be used to carry wedges, bar wrench and chain files so they are easily accessible.

Take Care of Your Axe and File



File

Chain files must be fitted with guards to prevent puncture wounds when carried by fallers and buckers. File tangs can be altered in a variety of ways to prevent puncture wounds.

- Curl the tang end completely around.
- Fix a wooden handle over the tang. Pieces of plastic wedge or valve stems from tubeless tires also work.
- Use a custom-made handle.
- Carry the files in a container (copper tubing with end caps is shown).

The handles prevent puncture wounds and give better grip and control of the file. Gloves must be worn when filing saw chains.

Special Tools

Hydraulic Jack

Hydraulic jacks are invaluable for wedging large right-of-way trees away from streams and lakes. If the jack does not have a steel plate attached by springs, a proper steel jack plate must be available.

(See page 48 for detailed instructions on use of the hydraulic jack.)

Temporary Platform

A temporary platform should be available. Temporary platforms are useful when it is necessary to cut a tree above a large bell-butt or when falling on extremely steep terrain. Some fallers make their own temporary platforms from saplings. Figure 1 shows a simple method to do this.

1. Cut a notch in the tree at a slight upward angle. Insert piece of sapling (A) in notch.
2. Cut another sapling (B) and lay it across (A). Cut shallow notch in sapling (A) to stop (B) rolling off. Make sure the other end of (B) is firmly on the ground.

Long Chain Bar

Long chain bars are required when falling large trees or danger trees. Where timber size warrants, long bars must be used by the falling crews.

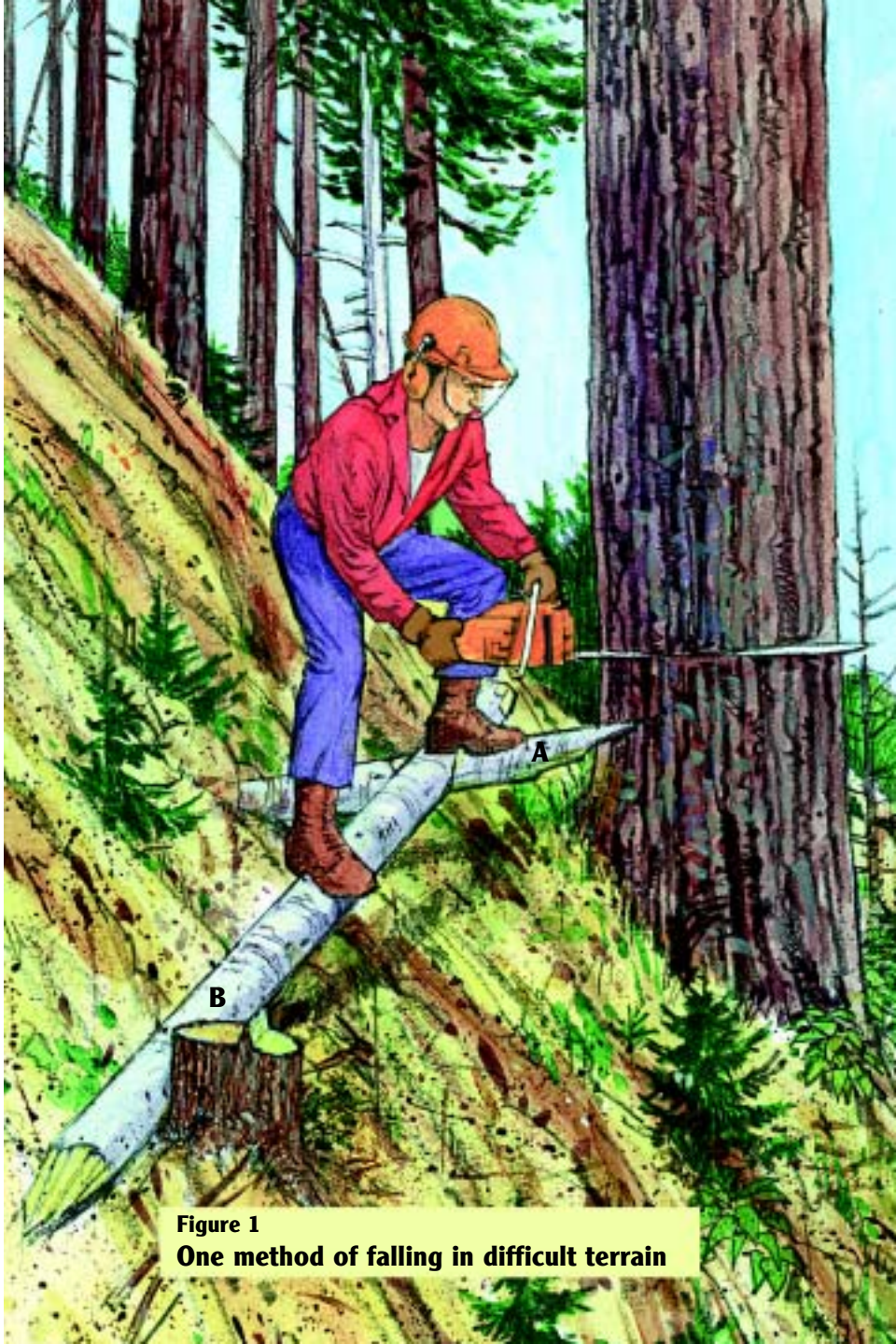


Figure 1
One method of falling in difficult terrain

Transporting Workers and Tools

Chainsaws, chain oil and enough fuel for the day may be carried in the same vehicle with workers, provided the saws, oil, fuel and any vapours from the fuel are completely isolated from the passengers.

Larger amounts of fuel must be transported in an approved fuel tank permanently secured to the vehicle or in a vehicle carrying no workers other than the driver.

All materials, equipment and tools must be placed and secured in vehicles so that workers cannot be injured by accidental contact with them.



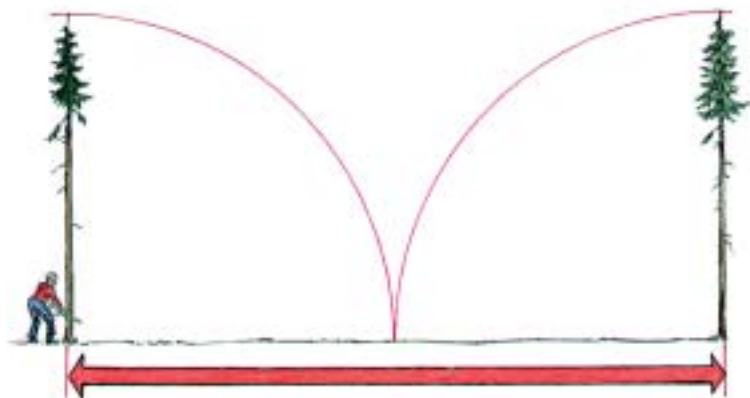
Crew Transport

GENERAL WORK PROCEDURES

Every logging operation must develop and document the falling and bucking procedures to be used in that operation. It's the supervisor's responsibility to make sure all workers know and follow these written procedures. As a minimum, the procedures must include:

Minimum and Maximum Distances

The *minimum* distance to be maintained between a working faller and any other worker is *two tree lengths*. When in doubt as to the actual tree height, use 90 m (300 ft.) as the minimum distance. If the terrain is steep and there are workers downslope of the faller, this distance must be increased.



Workers must remain at least two tree-lengths apart from each other at all times

The maximum distance between fallers is the distance at which checking on a buddy or giving assistance becomes difficult. Variables such as terrain, creeks, and weather make assigning an absolute maximum distance impossible. Use a distance of 300 m (1,000 ft.) as a rough guide.

Good pre-planning of falling quarters or strips will ensure that the minimum and maximum distance between fallers is maintained.

Falling and Bucking Difficulties

During the course of a work day a faller can encounter situations that may be considered “difficult.” It could be a danger tree, an extreme leaner or a jackpot. With experience, skill and ingenuity these situations will be resolved. *Fallers and buckers must never overestimate their ability.*

In difficult situations, you must follow the written work procedures covering that particular situation. Assess the problem carefully. Consider the complications and the alternatives. If there is any doubt as to how to get the job done safely, call your buddy for advice or call your supervisor.

NOTE: Some common falling and bucking difficulties, and their possible solutions, are discussed in the sections beginning on page 44 and 87.

Checking System

The written work procedures must include provisions for checking the well-being of every faller and buckler at the operation throughout the work day. The “buddy” system is the most commonly used method.

Fallers and buckers must be instructed to check on each other during the day. They must be placed in their respective quarter or strip so they can communicate with their buddy. Checks must be made at least every 20 - 30 minutes.

Check on your buddy frequently. Relying on the noise of the saw is not a foolproof method of checking. You must be absolutely sure the saw you hear is your buddy's. If the saw is not heard, the buddy not seen, or trees are not seen falling, then contact must be established immediately.

Where visual and voice contact is difficult to maintain (fallers working parallel gullies, for example), some operations have successfully used motion sensors or small two-way radios in addition to a qualified watch person, as a checking system. Radios must not be used as the only person-check system.

Guidelines for Placing Workers

In every logging operation fallers and buckers must be located so that each is in a position to receive and render assistance. In cases of injury, the time lapse between the accident and first aid treatment directly affects the seriousness of the injury. The sooner help arrives, the better. When placing fallers and buckers in their respective quarters or strips, consider the following:

- Fallers and buckers must be placed in quarters, skid roads, or strips in accordance with the established minimum and maximum distances.
- Adequate first aid supplies and equipment must be centrally located. Each faller and buckler must know the exact location of those supplies and how to get there.
- If a worker is employed under conditions where he or she might not be able to summon help in case of injury, the employer must provide means of checking the worker every 30 minutes.
- Suitable transportation for injured workers must be provided.
- Each faller and buckler must be thoroughly familiar with transportation and communication arrangements.
- Each faller and buckler must carry a whistle or other audible signalling device. This should be readily accessible for use in an emergency.
- Fallers and buckers, or others who have associated duties, must have a thorough knowledge of how to get and give assistance in each falling area.

The written work procedures must also outline a “checkout” procedure at the end of every shift. Each worker in a falling and bucking operation must be individually accounted for prior to the downward (out-of-the-woods) movement of any crew crummy or vehicle at the end of shift.

When more than one crew vehicle is used, don’t assume that a faller, who usually rides in a specific vehicle, has already returned to camp or the pick-up point in another vehicle.

A Review of Work Procedures

The work procedures for falling and bucking in a logging operation must be reviewed regularly to ensure they are viable, up-to-date, and include any changes to logging plan requirements.

- Employers must ensure that supervisors review work procedures with workers on a regular basis, and before a new employee starts work.
- Supervisors must ensure that workers who have trouble reading fully understand the procedures.
- Workers should review work procedures after a layoff.
- Workers should be asked to sign a statement indicating they have reviewed and understood the written procedures.

TRAINING FALLERS AND BUCKERS

In the past, many workers learned falling and bucking by trial and error. With little or no training, the quality of their workmanship was often poor. Lacking a background in safety and proper saw-handling skills, these workers were a danger to themselves and others.

Every employer must ensure fallers and buckers, and all workers using chainsaws, are adequately trained and supervised. Fallers and buckers must be trained to a standard that is acceptable to the WCB. An example of this is the WCB Falling and Bucking Training Standard.

Pre-employment Screening

It's important to determine the worker's employment history and related work experience. Useful experience might include the use of power saws for log bucking in landings, slashing work for forestry operations or tree spacing experience.

On-the-Job Screening

Evaluate the trainee's work habits. If the trainee shows a continued lack of understanding and persists in ignoring safe work practices, the worker should be discouraged from further training and placed in more suitable employment.

Proper Training

Training should consist of instruction in the following:

- **Maintaining a chainsaw.** Basic saw maintenance and repairs including chain filing, adjusting chain tension and brake, adjusting the carburetor, changing filters, and protecting the saw if it's to be left outside.
- **How to hold the saw.** (See illustration on page 9)
Basic hand and body position. Trainees should learn to keep both hands on the saw when cutting and to maintain a firm but not tense grip, with the thumb under the handle bar. They must learn to keep the body to one side of the saw when cutting and never to straddle the saw.
- **Work area.** Finding a safe place to stand when falling or bucking, brushing-out around the tree, making an escape route (and an alternative escape route if necessary) and recognizing the hazards present in each situation.

- **Work procedures.** Trainees must know the general work procedures used by their firm. The procedures must include the following minimum instructions to fallers and buckers. They must learn to assess hazardous situations like leaners, blowdowns and danger trees. They must learn how to “work” a quarter or strip safely and efficiently. They must learn the “buddy” check system, how to get and give first aid and what personal protective clothing to wear. They should also know the requirements of the Forest Practices Code.

NOTE: The Falling and Bucking Training Standard is a training package complete with videos, tapes and manuals, available from the Workers’ Compensation Board. It outlines the minimum acceptable training standards for workers engaged in falling and bucking activities.

Proper Trainer

Having the right trainer is the key to good instruction. Trainers must be experienced in all aspects of falling and bucking. They must have a proven safety record and be able to communicate well with trainees and supervisors.

Supervision

Supervision must be continuous during the initial training period. The supervisor must receive progress reports and make frequent spot checks on workmanship and falling practices. The supervisor is ultimately responsible for the adequate direction, instruction and safety of the trainee.

Continuous Review

Reviews of safe work practices and written procedures must be done on a continuing basis. Such reviews are important for the trainee and for seasoned fallers. They are necessary because of the many variables involved in falling and bucking. Weather, terrain and logging practices are always changing.

It’s also possible a worker may not encounter a particular falling and bucking problem for several years (having to buck a bad windfall, for example). Regular reviews will provide training to handle these unfamiliar situations.

Continued reviews should be done through department meetings, on-the-job training and direct supervision. Department meetings should include everyone in the falling and bucking operation. The meetings, discussion groups or workshops should be well-planned, well-presented and designed to promote full participation.

Firms that practice this type of continuous review enjoy low accident rates and professional workmanship.

Planning

Before timber is felled, the supervisor should walk the quarter or strip and make note of any unusual or dangerous conditions (for example, danger trees, windfalls, rock bluffs, widow-makers, etc.). Such information must be made known to the faller prior to the felling of timber. The faller must also be made aware of any other activity in the immediate area. Maps are useful in describing terrain and road systems.

Before starting your saw, you must determine the best location to start the quarter or strip. Generally this is with the timber stand's prevailing lean. The best position will allow timber to fall into the clear.

If the terrain is difficult, you should fill draws and gullies first and hold the timber to the ground contour. You should also keep parallel falling leads and avoid crossing the lead.



Assessing Tree and Falling Area

In all cases, you must assess each tree or danger tree to be felled.

1. Check for material lying on the ground to see if logs, saplings or chunks will be disturbed by the falling tree, swing around and strike the faller.
2. Check to see if other standing trees or danger trees will be struck or brushed when the tree being cut falls.
3. Examine the tree itself. Check for:
 - lean (use the axe as a plumb)
 - loose limbs, chunks or other overhead material
 - rot, cat-faces and splits at the base

4. Plan your escape route and an alternative route in case the tree does not fall according to plan.
5. Brush-out at the base of the tree and along your escape route. Brushing-out means clearing or bucking all nearby saplings, chunks or trees that may fly back and strike you when the tree is felled. Brushing-out permits the free and safe use of tools. It removes kickback hazards and allows a quick and unobstructed path to safety.
6. Make sure you have all the tools you'll need for the job, including wedges and enough fuel in the saw to finish falling the tree.
7. As falling progresses, try to keep the falling face as straight as possible. This will make checking on your buddy much easier.

Safe falling means thinking ahead. It means:

- ensuring that all workers are clear of the hazardous area before falling begins
 - falling each tree in the safest possible manner
 - falling each tree so that it can be safely bucked
-

The Falling Cuts

The key to good falling is the undercut. A sufficient undercut must be made in each tree being felled.

Fallers must ensure:

- the undercut is complete and cleaned out
- appropriate measures are taken to control the fall of the tree
- no falling cut is started unless wedging tools are available
- they work from the high side of the tree whenever possible

The Undercut

A properly sawn and properly located undercut will allow the tree to fall freely in a chosen direction. Most saws come with directional arrows on the sideplate. These can be used as guidelines when sawing the undercut.

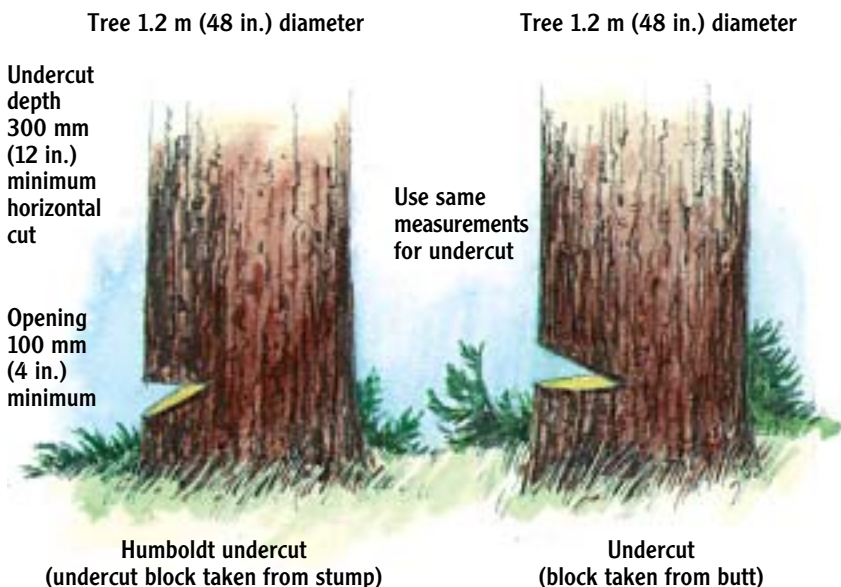
More time spent on a good undercut will avoid many problems later. A clean, uniform undercut must be used on all trees. The following guide should be used:

1. The undercut should be one-quarter to one-third of the tree's diameter.

2. The opening of the undercut should be at least one-third of its depth (one inch vertical for every three inches horizontal). In large trees with “bell” butts, it may be necessary to remove some of the flare to allow easier placement of an undercut.
3. The two cuts which form the undercut must not cross where they meet, in order to prevent formation of Dutchman (see illustration on page 31).
4. The horizontal part of the undercut must be level and well cleaned out where the cuts meet to prevent Barberchair and/or unintended Dutchman.

Both undercuts shown in Figure 2 are correct. Most operations insist on the “Humboldt” undercut for closer utilization of the log. An undercut, properly sawn and properly located, must be used on all trees that have a six inch diameter or larger DBH.

Figure 2
Undercut



The Backcut

Enough holding wood must be left to maintain control of the tree so that it does not break, slip or twist off the stump and fall in an unplanned direction.

1. The backcut must be level and sawn in slightly above the horizontal plane of the undercut (20 - 50 mm or 1 - 2 in.) This forms an anti-kickback step.
2. Care must be taken not to saw off the corners.
3. In trees with thick bark or those with an accumulation of small growth, moss or duff around the butt, it may be necessary to clean the tree to see the amount of holding wood remaining.

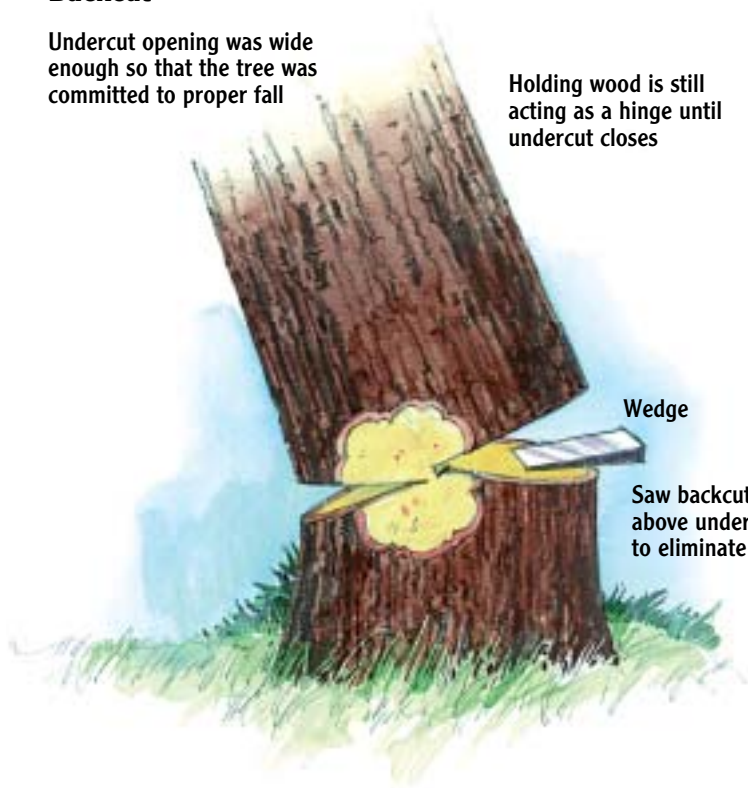
Figure 3
Backcut

Undercut opening was wide enough so that the tree was committed to proper fall

Holding wood is still acting as a hinge until undercut closes

Wedge

Saw backcut slightly above undercut plane to eliminate kickback



Dutchman

In Figure 4 the undercut and backcut have been sawn. The tree is ready to fall. However, the top cut of the undercut has been sawn too far. The bottom cut does not meet properly, leaving an unintentional Dutchman or unclean undercut in the tree. The same situation would occur if a piece of undercut were left in or the bottom cut sawn too far.

In Figure 5 the tree is starting to fall in its intended direction. The unclean portion of the Dutchman cut closes at the forward edge and the tree hesitates. When the tree hesitates it may rock for a moment, then fall, tearing the holding wood or causing the tree to split lengthwise, creating a Barberchair. Or the tree may stop falling and hang in a lean. The faller would then have four choices:

1. Cut off all remaining holding wood and lose control.
2. Lift with wedges and increase the chance of Barberchair.
3. Push with another tree.
4. Re-fall the tree.

Figure 4
Dutchman Open

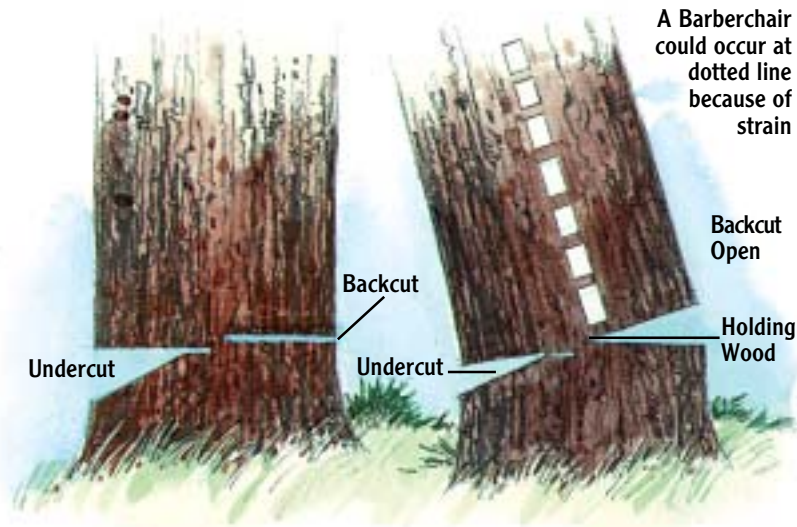


Figure 5
Dutchman Closed

A Barberchair
could occur at
dotted line
because of
strain

Backcut
Open

Holding
Wood

Unintentional Dutchman

Unintentional Dutchman is caused by:

- undercut not fully cleaned out
- the two saw cuts of the undercut not meeting properly (i.e. one cut is sawn past the other)

An unintentional Dutchman creates several hazards:

- As the tree starts to fall, the Dutchman closes, which tears the holding wood and causes the tree to fall in another direction.
- The stress on the falling tree causes it to split vertically or Barberchair, making the area behind it very hazardous.
- The misdirected tree may fall into standing trees or danger trees, causing broken limbs, tops or other debris to strike the faller.

Intentional Dutchman

An intentional Dutchman has been used by fallers to overcome some falling problems. When a tree could not be “pulled” or “thrown” by other means, fallers have used an intentional Dutchman, but only after understanding and evaluating the hazards involved.

The use of an intentional Dutchman always involves the cutting off of the holding wood on the side of the tree lean. This causes the tree to continue to swing and also prevents a Barberchair.

Even for the most seasoned and skilful faller, the amount of pull or throw created by the Dutchman cannot always be determined. This could mean losing control of the tree. For this reason, the use of an intentional Dutchman is not recommended.

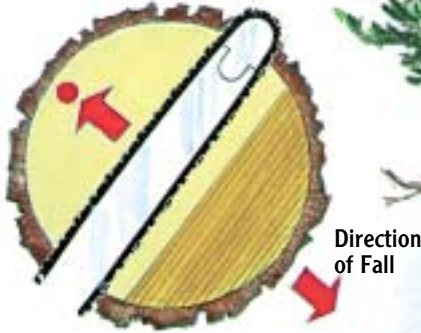
Barberchair

There are several causes:

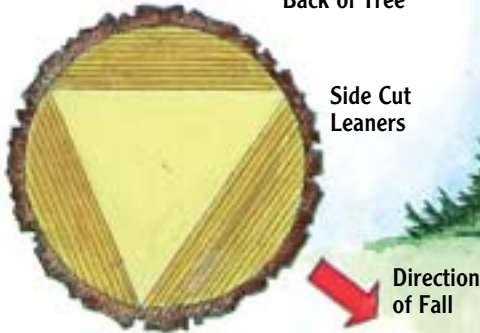
- lack of proper undercut
- heavy lean or pressure on a tree
- Dutchman in the undercut
- failing to side-cut or side-bore leaners
- natural splits, shakes or other deformities
- tree falling across a hog-back, stub danger tree or making contact with standing timber
- falling in excessive wind

Figure 6
Cuts to Prevent Barberchair

Strain

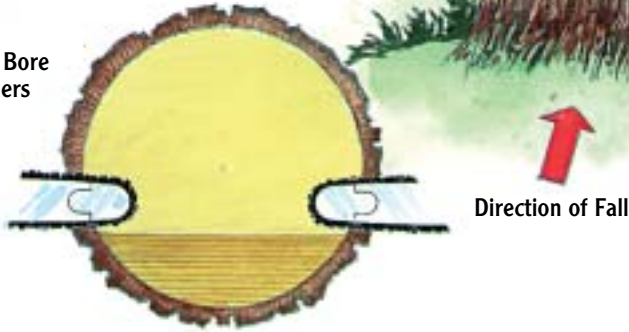


Bore and Cut to
Back of Tree



Side Cut
Leaners

Side Bore
Leaners



All trees will Barberchair, but the following species should be most suspect:

- | | | | |
|--------------|---------|----------------|-----------|
| • Cottonwood | • Alder | • Yellow Cedar | • Spruce |
| • Balsam | • Pine | • Red Cedar | • Hemlock |

Danger Trees

Danger trees include any tree that is hazardous to workers because of location, lean, physical damage, overhead hazards, deterioration of limbs, stems, or root systems.

Guidelines for Falling Danger Trees

- Danger trees must be felled:
 - progressively with the falling of other timber
 - before falling live trees
 - into open areas
- No falling, bucking or limbing activities will be started in an area made hazardous by a leaning danger tree, or a danger tree which has been brushed by a felled tree, until the hazard danger tree has been felled.
- Avoid “pushing” a danger tree, other than to overcome a falling difficulty. The top may break off or the danger tree may buckle in the middle and fall in your direction.
- Danger trees must not be wedged over except in cases of absolute necessity, and then only after a careful assessment of the ability of the danger tree to withstand wedging.
- All danger trees that could endanger workers must be felled before yarding or skidding operations begin.
- Do not fall danger trees when there is above-average movement of tree tops due to wind.
- The tops of danger trees must be visible before falling begins.
- Do not fall danger trees that contain heavy, wet snow without a careful assessment of the hazards.
- Each danger tree poses a different problem and should be evaluated with caution. It should always be presumed that the tops are rotten and that material could be dislodged with the slightest jarring or vibration.
- Where conventional methods cannot be safely used to fall danger trees, blasting or other safe, acceptable methods must be used.

By following all safety rules and regulations, by adopting safe work practices and by consulting written procedures, it is possible to fall danger trees safely. Difficulties sometimes arise when fallers, through lack of experience or haste, try to fall danger trees using their saw, instead of using other, safer methods.

When you think trees or danger trees cannot be felled safely do not continue working in the area. Immediately alert any other workers in the area and your supervisor. The supervisor is responsible for ensuring the hazard is controlled.

Planning

1. Check material lying on the ground in the immediate area. Will it be disturbed by the falling danger tree? If so, will it be a danger to you or others?
2. Before starting the falling cuts of a danger tree check to see if other standing trees or danger trees will be struck or brushed.
3. Plan your escape route and an alternative route, in case the danger tree does not fall according to plan.
4. Make sure you have all the tools you'll need for the job, including enough fuel in the saw to finish falling the danger tree.
5. Examine the danger tree itself. Check for the following:
 - Size, height and condition.
 - The arrangement of limbs may be a factor to consider. Lean can be difficult to determine if a danger tree has no limbs. Use the axe as a plumb.
 - Loose limbs, loose bark or other materials which present a hazard. Sometimes loose bark can be removed with a long pole. Be ready to move quickly when bark is dislodged.
 - Sufficient room to work. Clean out around the base of the danger tree. Look for an escape route and make sure it's well brushed-out.
 - Rot, cat-faces and splits at the base.
6. If you encounter a difficult situation, discussing it with another faller or your supervisor will often help solve the problem.

Making the Cuts

1. Study the danger tree carefully. Allow for sufficient holding wood to provide directional falling control.

2. Always work from the safe side of a danger tree – generally opposite to any side lean but not under loose material.
3. Put undercuts and backcuts in at a comfortable stump height so you can watch for hazards above.
4. Danger trees require a large undercut, deep and wide. The undercut should be about one-third of tree diameter, or as much as a heavy leaning danger tree will allow. On short danger trees, the undercut should be sawn into or past centre.
5. Make sure the undercut is at the correct angle to the intended direction of fall.
6. Keep glancing at the top of the danger tree when sawing the undercut. The danger tree may fall as soon as the first cut is started. Use another faller as a watcher. Ensure you have continual contact with the watcher.
7. Check the condition of sawdust and the undercut block for signs of rot. Your findings may affect your falling procedure and help determine what cuts are to be made.
8. Ensure the backcut is sawn in, above the level of the undercut, to prevent the danger tree from kicking back off the stump.

Common Problems in Falling Danger Trees

- Loose slabs on split danger trees.

Check your escape route before removing slabs. Saw them one at a time, using care and judgement.

- Loose bark.

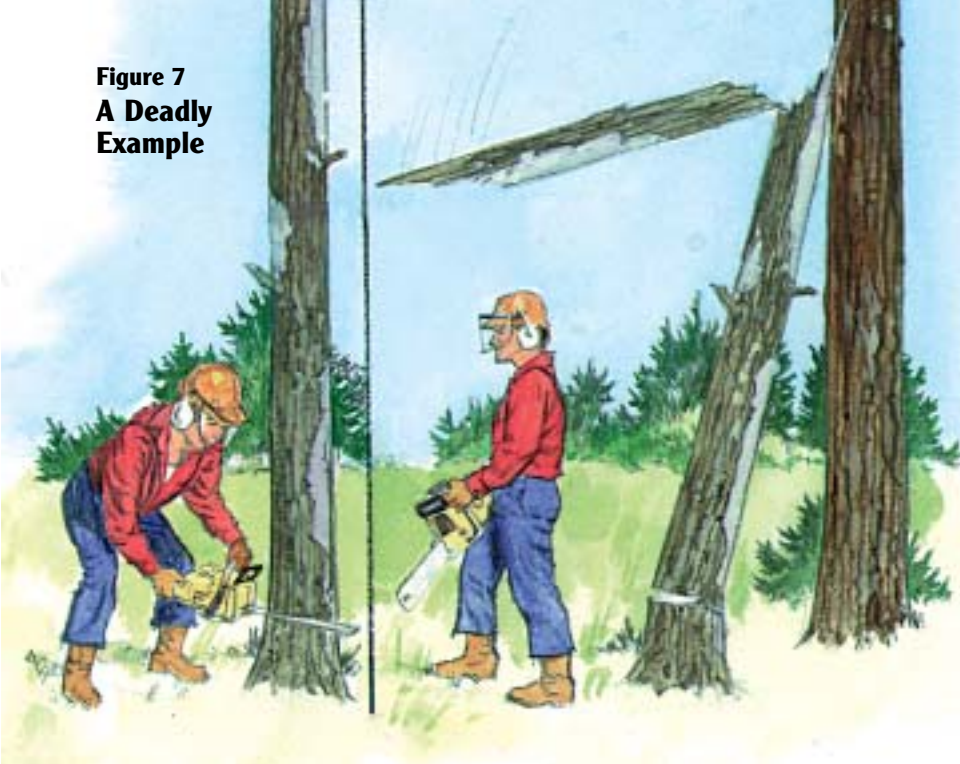
Bark is sometimes like a tube around the danger tree. If given a start, it can let go in an avalanche.

- Danger trees unsafe to fall.

Sometimes danger trees can be safely and economically taken down by using a line from a crawler tractor, rubber-tired skidder or yarding equipment. A 600 - 900 mm (2-3 ft.) diameter danger tree can be pulled over with a large crawler tractor and winch, provided the root is sufficiently rotten and the tractor is positioned in a safe location.

Unfortunately, some danger trees are too large for this technique or are not immediately accessible to such equipment. Where it's not possible to use equipment or lines, hazardous danger trees should be felled with explosives. Fallers must stop work in the area until the danger tree has been removed.

Figure 7
A Deadly
Example



Occupation: Faller
Age: 48
Experience: 10 Years

The faller was cutting a danger tree on level, open ground. The danger tree was 380 mm (15 in.) in diameter and 36 m (120 ft.) high. When the danger tree started to fall, the faller picked up his saw and walked away. The falling danger tree struck another standing tree, fractured and "jack-knifed." It struck the faller, causing fatal injuries.

Use of Explosives

Some danger trees are too hazardous to fall with saws because of loose bark, large cracks, slabs, school-marms or other defects.

The blaster is in charge of the blast site. Safe work procedures regarding the use of explosives must be available and communicated to all workers on site.

Only the holder of a valid Blaster's Certificate, issued by the WCB, or acceptable to the WCB, is permitted to conduct or direct a blasting operation and only if the work involved is within the scope of the blasting certificate.

A Deadly Example

Figure 8 shows a fatal accident in which the faller was found pinned between a cedar butt and a small windfallen danger tree (shown centre). The cedar tree fell among the standing trees and the butt slid backwards off the stump toward the faller, pinning him against the windfallen trees. A section of the danger tree had to be cut out to remove the body.

The following observations were made at the accident site:

- The immediate area contained many danger trees in varying stages of rot. Some were standing, others were leaning.
- Danger trees standing in the path of felled trees were not felled beforehand.
- The faller was not using a falling “face” or any definite lead.
- The faller hadn’t cleared the area of obstructions and didn’t brush-out a safe escape route.
- All the trees were felled among other standing trees or danger trees.

This accident could have been prevented! Remember to:

1. Brush-out a safe escape route before falling.
2. Remove danger trees and other obstructions from the path of trees to be felled.
3. Fall timber into the clear and develop a falling face as straight as possible.



Figure 8
A Deadly Example



Pole Cutting

Pole cutting is a selective logging process where certain trees are felled and removed from the timber stand before starting normal logging operations.

Other selective logging practices are:

- thinning to improve the stand
- removing timber sticks for bridge stringers
- harvesting pilings

Each of these activities should have similar safe work guidelines.

Guidelines for Poling Operations

Pole cutters face additional hazards because they must fall pole timber that is closely surrounded by other standing trees and danger trees. It's even more difficult to fall this material into a clear area. The chance of hanging pole trees into other standing trees is greater than in normal clear-cut falling operations. The hazard from falling, flying or thrown objects is also greater.

Safe work procedures for falling poles are much the same as for falling other timber. The guidelines found in all sections of this manual are applicable. However, certain specific safeguards should be practiced:

- Minimum and maximum distances between pole cutters and other workers must be maintained, as in other falling and bucking operations.
- Any danger tree or defective tree standing in the intended direction of fall or which could reach the work area, must be removed before falling pole trees.
- Any danger tree or defective tree that poses a threat to other workers using the pole-skidding "roads" or "trails" must be removed before skidding operations begin.
- Pole cutters must watch for danger trees or other defective trees that may be brushed by the felled tree. These may sway forward before falling backwards into the falling area.
- Any danger tree or defective tree brushed by a falling pole must be felled before the pole tree is bucked or limbed.
- Pole cutters must, while watching the falling tree, also keep a sharp lookout for limbs or chunks that might be thrown back.

- Where the falling tree brushes standing timber, pole cutters must watch for widow-makers.
- Any trees with incomplete cuts must be felled immediately. Such trees must not be left standing in an area of poling activity. When a tree cannot be completely felled, for any reason, an immediate report must be made to the supervisor. The supervisor is responsible for ensuring the cut-up tree is removed before work is undertaken in the area.
- Any limbs, broken tops or other debris left hanging in trees which cannot be felled at the time must be reported to a supervisor. The supervisor will then take the necessary precautions for workers in the area and those who may enter the area in the future.
- When a pole has been accidentally “hung up” in another tree, and there is any doubt as to the faller’s safety in overcoming this difficulty, skidding equipment must be used to remove the pole. This is done by pulling on the butt end until the pole is safely down. Skidding equipment must not be positioned under the suspended tree or in any hazardous position.
- The whole pole tree should be skidded out to the road or landing before the butt or top is trimmed. Where this is not possible, long butts, tops and limbs must be reduced in a way that minimizes the hazard to future workers who re-enter the area.
- When peeling a pole, safe footing must be provided.
- In trimming knots with an axe, the pole should be kept between the worker and the axe for protection against glancing blows.

Common Falling Difficulties

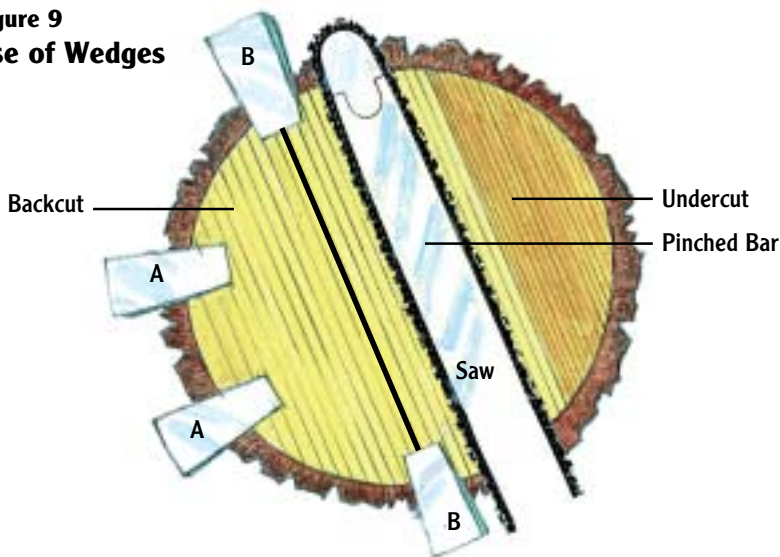
Tree Sits Back

Just as the faller is completing the backcut, the tree starts to sit back on the bar. This can happen because:

- the faller misjudged the tree's lean
- the stump contained hidden rot
- an unexpected gust of wind took it backwards
- the faller didn't start a wedge in the backcut as it was being sawn

If enough holding wood remains, the tree can still be wedged over in its intended direction. Be sure to clean the bark away above and below the backcut, to allow wedges to bear on solid wood. If the tree is large enough, place wedges in the backcut as shown in Figure 9.

Figure 9
Use of Wedges



1. Insert two wedges, if possible, in position A until the tree starts to lift.
2. Insert wedges in position B to finish falling the tree. If there is no room for position A, alternate hitting the wedges in position B – one or two blows each side.

Obviously, to overcome falling difficulties you need to be properly equipped. Make sure your saw has enough fuel and you have enough wedges in your pouch **before** you start the job.

Sometimes the tree may be leaning backwards heavily and you can't start wedges in the backcut. In this case, you have four choices:

1. Re-fall the tree.
2. Use a hydraulic jack.
3. "Push" the tree over by falling another tree into it.
4. Notify your buddy of the problem, then notify your supervisor.

1. Re-fall the tree

If you decide on this option, you must take extra care when working on the cut-up tree. Also, because the falling plan has now changed, you must clear another escape route before starting to cut again. The best way to do this is to face the cut-up tree and brush-out the escape route toward it, always keeping an eye on the tree in case it starts to fall.

Never turn your back on a cut-up tree!

After the escape route is cleared, you can then begin re-falling the tree using a second undercut. There are three methods for putting in this second undercut. The third method (Figure 12) should be your first choice as it allows the most control.

Figure 10

Figure 10 shows a large tree which has "sat back" heavily on the backcut. The faller has sawn a good-sized second undercut at an angle on the right or left side (depending on best lay and escape). The second undercut has been sawn from the stump, but the top cut of the new undercut is the original backcut. By sawing the second undercut at an angle, part of the backcut will remain intact to support the tree while the second undercut is sawn in. When the second undercut is well cleaned out, the faller should run the saw into the original undercut and saw off the holding wood.

As the tree falls, very little control can be maintained because all the remaining holding wood has been sawn off.

Figure 11

Figure 11 shows the same situation, except that a bit more control can be maintained by sawing the holding wood over its entire width. The small undercut would act as a lip to help prevent the butt from sliding backwards.

The choice of these two methods (Figures 10 or 11) would depend largely on the direction in which the tree appears to be leaning, obstructions to its free fall, steepness of terrain, and the location of the new escape path.

These two methods give little or no control of where the tree will fall and are not recommended if the third method (Figure 12) is possible.

Figure 12

Figure 12 will allow for most control being maintained because a proper undercut, backcut and holding wood can be sawn in above the original cuts. Maintain the vertical distance between the first falling cuts and the new falling cuts to at least the distance of the tree's diameter. A danger exists that a vertical split can occur between the first and second set of cuts.

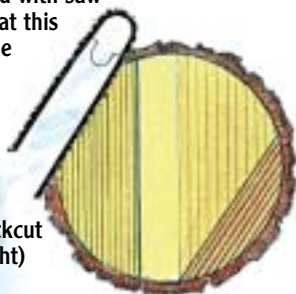
Figure 12 shows the preferred method, if conditions allow it to be used.

Re-felling the Tree

First Undercut
Direction of Fall



Start to cut off holding wood with saw bar at this angle



Backcut (tight)

Second Undercut

Figure 10
Method 1
(not recommended)

Wood is tight here in backcut and will support tree until last moment

Second undercut taken at an angle out of backcut

Start to cut off holding wood with saw bar at this angle

Backcut (tight)

Second Undercut

Figure 11
Method 2
(not recommended)

Take second undercut from bottom of backcut – saw or chop out as much as will be allowed

Second Backcut

Second Undercut

This dotted line indicates where split may occur

First Backcut (tight)

Figure 12
Method 3
(recommended)

Vertical distance between first backcut and top of second undercut should be equal to tree diameter to prevent splitting

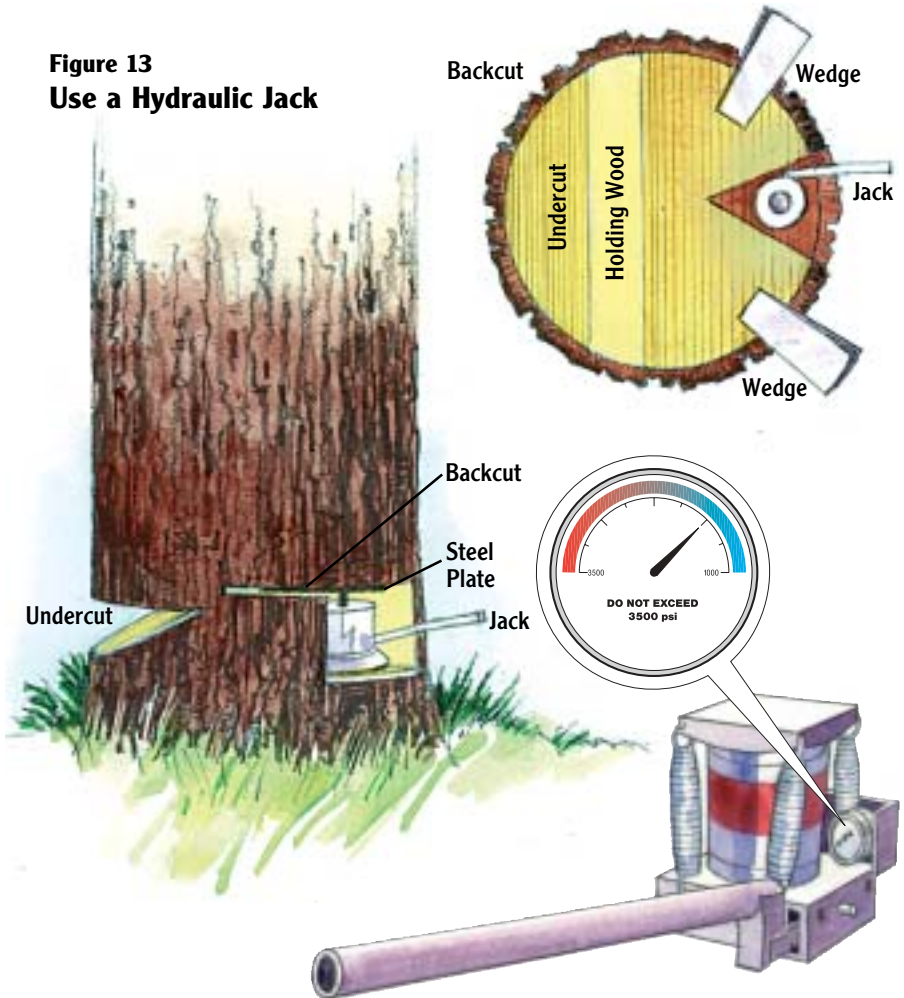
2. Use of a hydraulic jack

Hydraulic jacks can be used to solve a variety of falling difficulties. Special attention should be paid to the degree of lean and the species of the tree.

A jack (or jacks) may be necessary when:

- the tree may otherwise fall into a stream or lake
- the tree may otherwise fall back into standing timber
- the tree may break over a roadway or gully
- the tree is leaning uphill
- you want to maintain a particular falling pattern

Figure 13
Use a Hydraulic Jack



Equipment required (Porta-power type)

This type is common to the industry and is used in conjunction with a cylinder collar welded onto the top metal plate to prevent the jack from slipping out as the backcut opens. The lifting capacity of the jack must be of a size and type that will allow the tree to be lifted and felled safely. This type of hydraulic jack may be equipped with lines for remote operation in hazardous situations.

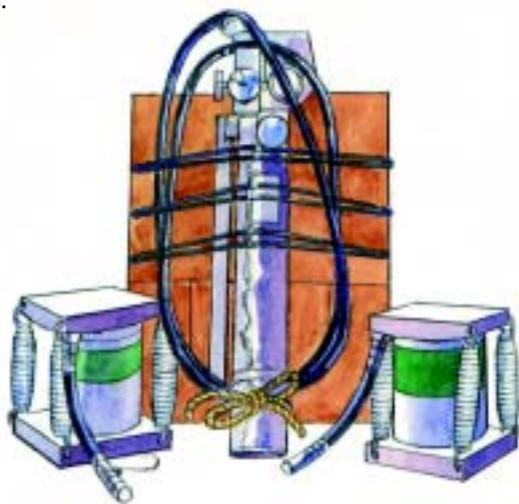
Procedure

Ensure that all your work procedures are available in writing. Before any cuts are made on the tree, you must brush-out an escape route and an alternative escape route if necessary.

1. Place undercut in tree.
2. Make backcut half-way into the tree.
3. Measure height of jack. Add thickness of steel jack plate. (If jack comes with plate attached, measure height of the assembly.)
4. Mark off this distance on a line below the backcut of the tree.
5. Make a second horizontal cut at this point deep enough to allow the jack to seat firmly.
6. Make two vertical cuts toward the heart of the tree as if you were cutting a wedge-shaped piece of pie.
7. Remove the cut-out segment of wood.
8. Insert the jack and place the steel jack plate on top of the lift ram.
9. Insert the jack handle and lift the back of the tree only enough to put a heavy strain on the jack(s). Do not jack too heavily at this point. If the strain is too great, the seals on the jack(s) can blow.
10. Set wedges in the backcut to help offset strain on the jacks. Wedges must be set progressively during the jacking of the timber.
11. As you cut the remaining wood at the back of the tree, lift periodically with the jack(s).
12. Continue cutting until only the required holding wood remains.
13. Lift the tree with the jack until it starts to fall. If the tree is exceptionally heavy, it may be necessary to use two jacks. Remote-controlled hydraulic jacks are now available. These allow the faller to be away from the base of the tree and out of the immediate hazard area.
14. Make a safe getaway.

Points to Remember:

- Make sure the jack is large enough for the job.
- All boring cuts should be horizontal and level.
- Use a heavy steel plate above the jack.
- Make sure the jack is placed well into the recess (300 x 450 mm or 12 x 18 in. minimum).
- Stand to one side when jacking.
- Make sure the check valve is securely closed.
- Use wedges on each side of the jack as soon as possible, in case the jack slips.



Portable Hydraulic Tree Jack

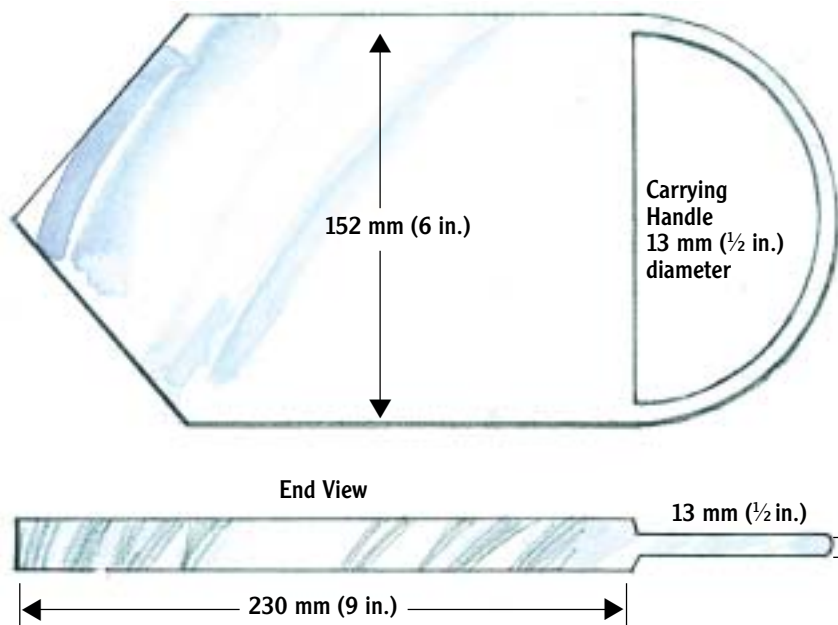
3. Pushing trees

“Pushing” a tree by falling another into it is a dangerous practice. It should be done only to overcome a falling difficulty, such as when:

- the tree has settled back and the faller is unable to start wedges
- the tree is limb-tied to another
- the tree is leaning against another

“Pushing” is dangerous because a gust of wind or vibration from nearby equipment can cause the cut-up tree to fall in an unexpected direction. If the faller only brushes the tree being pushed, that tree may sway and fall over into the area where the faller is standing. Also, dry tops or limbs can be broken off and thrown back toward the faller.

Figure 14
Steel Jack Plate



Guidelines for pushing trees:

- Assess the situation carefully. The pusher tree should be at a good angle no more than 20 degrees off the imaginary centre line behind the tree being pushed.
- Locate a safe escape route and if necessary an alternative escape route. While making the escape route, face the cut-up tree and brush-out toward it.

Never turn your back on a cut-up tree!

- Set wedges in cut-up trees.
- Face the cut-up tree when sawing undercuts and backcuts in the pusher tree.
- Take extra care with undercuts and holding wood. Make sure you have control of both trees. Saw a proper undercut and backcut.
- Direct all your efforts to falling the cut-up tree safely. Never do unrelated work under or in the area of a cut-up tree.

4. Notification of a hazardous tree left standing

If, for some reason, you can't fall the hazardous tree, you must:

1. Clearly mark the tree, preferably with brightly-coloured flagging.
2. Stop working in the hazard area.
3. Notify your buddy and your immediate supervisor.

The supervisor is then responsible for informing all other workers who might be endangered and will take appropriate action to ensure the tree is safely felled.

If you don't feel qualified to deal with a particular falling difficulty, ask for help. It is not a mark against you. Knowing the limit of your skills is one of the signs of a good faller. It is much better to ask for help early before that minor difficulty becomes a serious problem.

Upslope Falling

Upslope falling is a hazardous practice at any time, even on minimal hillside slopes. Upslope falling should only be used when conventional methods of falling timber cannot be used. Upslope falling should be confined to a specific site.

As the slope increases, the hazard increases. Upslope falling should not be undertaken in an attempt to overcome problems associated with riparian zone management. The practice of upslope falling is prohibited if workers are at risk of injury as a result of trees sliding down slopes, or loose rocks, stumps, chunks or bucked logs rolling down slopes.

Harvesting area planners, supervisors and fallers must plan work areas and work sequences that ensure that upslope falling does not put workers at risk.

Undertake a hazard assessment. Develop written safe work procedures and communicate these procedures to all workers who may be required to do upslope falling.

Leaners

Most trees have some lean. If the lean is slight and in the same direction as the falling face opened up, falling is straightforward. However, if the tree is leaning heavily, or must be felled against the lean, the situation is more hazardous and requires special consideration.

Heavy Leaners

A tree with a heavy lean develops enormous tension in the wood directly behind the lean. When an undercut is sawn into the tree in the direction of the lean, this tension increases. As soon as a conventional backcut is started, the tension is immediately relieved and the tree starts to fall. However, too much holding wood remains and, instead of the holding wood breaking off normally, the tree trunk will split vertically from where the backcut was started. A huge slab will develop and kick backward at the same time, causing a Barberchair. This whole process can take only a few seconds. The results can be disastrous for an unprepared faller. (See Figure 15, page 55).

In falling heavy leaners, do not attempt a deep undercut. The undercut should be no more than one-quarter of the tree's diameter. To prevent Barberchairs, leave the part of the wood which is most under tension, located behind the lean, until more of the holding wood is sawn out. Side notching and boring the backcut may be used in removing the excess holding wood.

1. Side-notching:

After the undercut block has been removed, the sides of the tree are sidecut or side bored, as shown in Figure 16, page 55. The remaining holding wood of the backcut will be sawn faster, with less likelihood of the tree splitting.

2. Boring the backcut:

After the undercut block has been removed, the tip of the saw bar is bored into the tree above the horizontal plane of the undercut. The faller must ensure that a few inches of holding wood are left between the start of the boring cut and the back of the undercut. It may be necessary to bore in from both sides if the tree is wider than the length of the bar. (See Figure 17(a), page 55.) The saw is worked backwards, cutting from the inside out, until the point is reached where the normal backcut would have been started. (See Figure 17(b), page 55.)

While boring, the wood directly behind the lean will be under enormous tension, as all other holding wood has been severed. Trees have been known to fall at this time before the saw has cut through, pulling a large section of root out of the ground. Use extreme caution if you must straddle the root wad.

Extreme Leaners and Leaners With Splits in the Butt

For extreme leaners and leaners with splits in the butt, the faller is advised not to bore through the butt. The bar will get stuck in the super-compressed, tensioned or split wood of the butt. These types of leaners can be extremely hazardous.

Procedure:

1. Make sure the lay of the tree (the direction it wants to go) is unobstructed.
2. Don't try to swing the tree.
3. Brush-out an escape route and if necessary an alternative route.
4. Put in as deep an undercut as possible, one-eighth to one-quarter of the tree's diameter.
5. Cut the corners of the backcut. Start with the corner opposite to your escape route. Don't cut too close to the corners, however, as the saw may get pinched.
6. Start cutting the backcut. Cut as rapidly as possible.
7. Watch for Barberchair or root pull. Sections of root can be pulled out and flail around.
8. Continue cutting until the tree breaks off and begins to fall.

If the tree is too hazardous to be felled with the above procedure, an alternative method, such as blasting, should be used.

Points to remember:

- Make sure your saw has enough fuel to finish the job before starting to work on heavy leaners or other problem trees.
- When boring with the tip of the bar, hold the saw tightly against your body to control kickbacks.
- The amount of holding wood to be left is determined by the side lean. The greater the side lean, the more holding wood must be held on the off-lean side. If there is no side lean, holding wood should be equal on both sides of the tree.
- When almost sawn out in the back, the faller should stand at arm's length from the tree and be prepared to move quickly in case a root is torn out.

Heavy Leaners

**Figure 16
Side-cutting**

**Figure 15
Barberchair**

**Figure 17(a)
Boring the
Backcut**

Undercut
increases
tension on
back of
tree

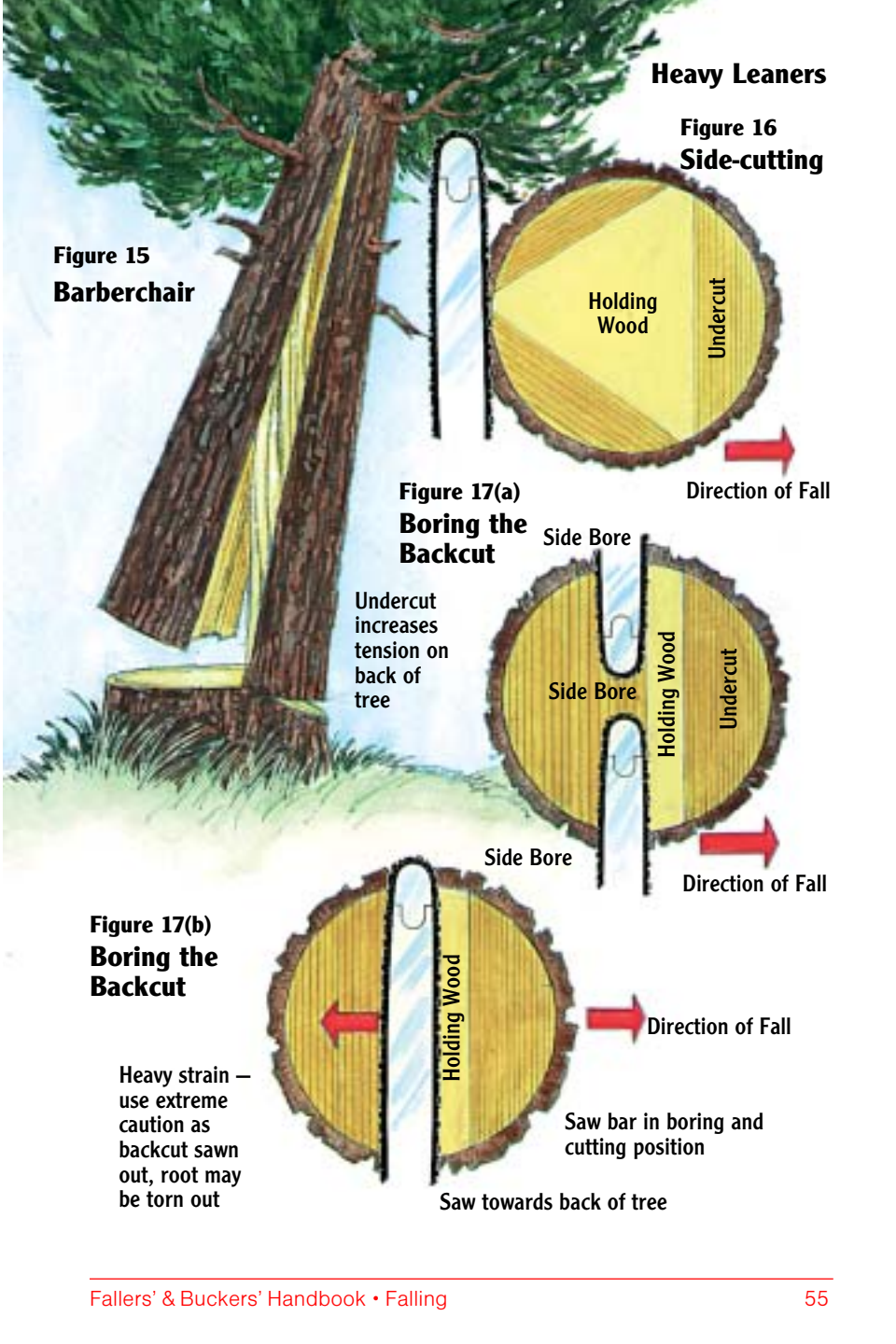
Direction of Fall

**Figure 17(b)
Boring the
Backcut**

Heavy strain –
use extreme
caution as
backcut sawn
out, root may
be torn out

Saw bar in boring and
cutting position

Saw towards back of tree



Leaning Trees Near Creeks and Swamps

Leaning trees may fall, without warning, from vibration or wind. Fall these leaning trees and danger trees first progressively with other timber.

Falling Against the Lean

On occasion, falling against the lean may be necessary to:

- keep the tree away from streams and lakes
- avoid needless breakage
- place the tree in a favourable bucking position
- avoid falling the tree into other adjacent standing trees
- keep the tree from falling on a road grade
- avoid crossing the lead or falling pattern

Making strict guidelines for falling a tree against its lean is difficult because of the variations in lean, height, diameter, species, terrain and conditions. In extremely cold weather, for example, frozen wood becomes brittle and undependable as holding wood. Falling against the lean under these conditions is hazardous.

Make a habit of plumbing each tree before falling, even if you feel sure you know where the lean is.

Figure 18
Small Tree Leaning in One Direction

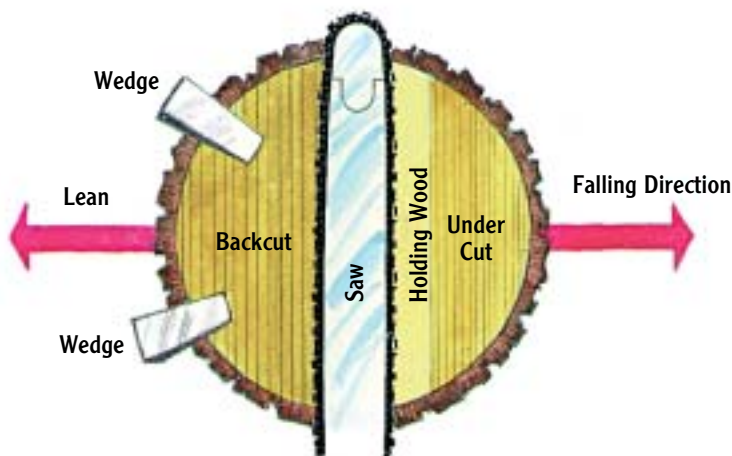
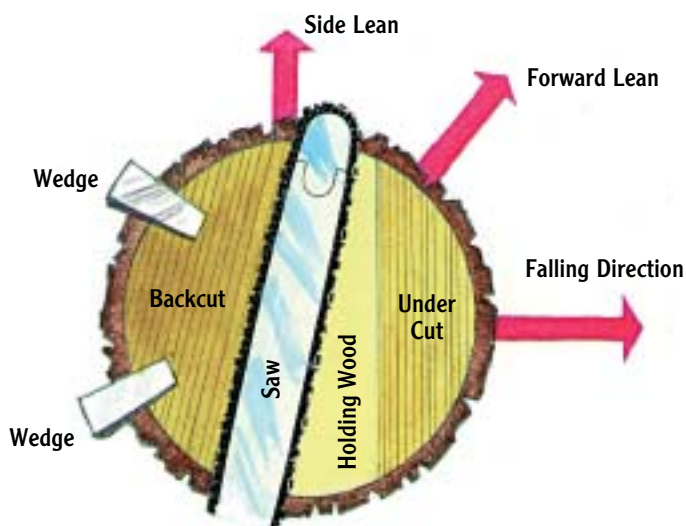


Figure 19
Tree Leaning in Two Directions



A large tree with heavy lean may be felled against its lean by inserting wedges in the kerf of the backcut and driving the wedges alternately as the backcut is sawn. In some cases, a hydraulic jack used in conjunction with wedges would be an advantage. (Use of the hydraulic jack is explained on page 48). Always use eye protection when driving wedges. Keep your head above the wedge or away from its path should the wedge come out of a cut.

Most trees can be felled away from their lean by using normal falling wedges and by keeping extra holding wood (as shown in Figures 18 and 19.)

On small timber, there may not be enough room for the saw bar and wedges.

1. Saw the backcut first.
2. Remove the saw and drive in wedges before the undercut is sawn out.
3. Put in the undercut.
4. Keep only enough holding wood as is necessary.
5. Finish falling with wedges.

In some cases the tree may be leaning in two directions, as in Figure 19.

1. Be careful not to cut off the holding wood on the leaning side; the tree may settle on the saw bar.
2. More holding wood is maintained opposite to any side lean. This will help draw the tree away from any side lean.

Trees Tied Together

Trees standing close together and tied in by limbs should be felled together. If the faller cannot see all the limbs he must assume the trees are tied together and, therefore, should be felled together. Under such conditions, if wedges are used to drop the front tree, a limb or dry top may break and fall, endangering the faller.

1. Cut up the front tree and place wedge. Make sure you maintain enough holding wood.
2. Start falling the second tree, allowing both trees to fall together.

Each situation of this kind must be carefully considered. If it appears particularly hazardous, talk with your falling partner and supervisor first.

Trees tied together should fall together!

Hang-ups

If trees are hung-up in another tree, special care must be taken when falling the tree supporting those that are hung-up.

1. Assess the situation carefully.
2. If possible, keep the trunk of the supporting tree between you and the hang-up(s). In other words, if the hang-up is held by limbs on one side of the supporting tree, fall the supporting tree from the opposite side.
3. If you are on steep ground, and the hang-ups are on the uphill side of the supporting tree, fall the tree by blasting or another safe alternative method.

Hang-ups can be avoided by:

- proper planning of the work area
- starting a face and falling into the open

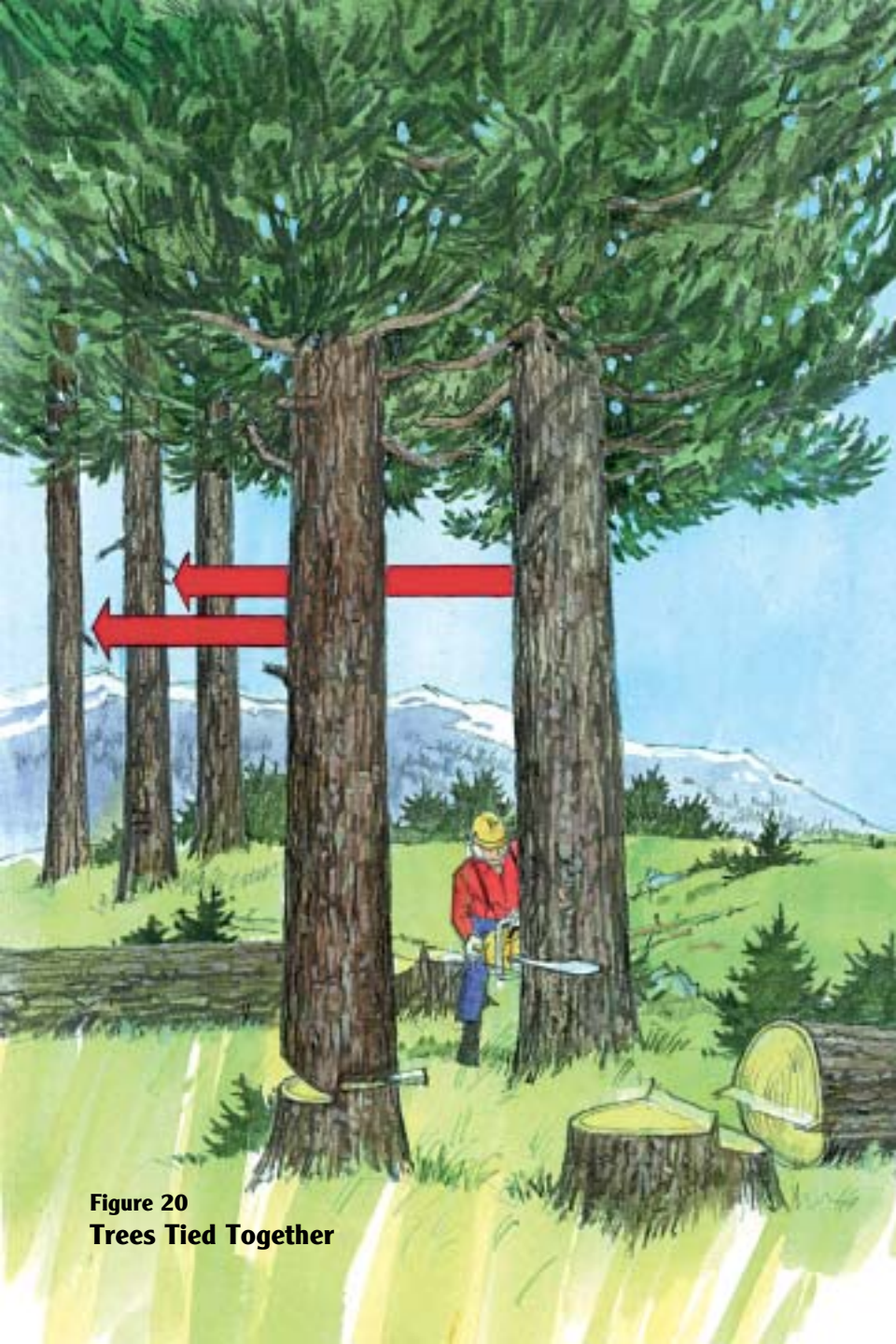


Figure 20
Trees Tied Together

Kickbacks

Many falling injuries are caused by saw kickbacks. You can reduce saw kickbacks by following these rules:

1. Use a saw equipped with chain brakes.
2. Make sure the chain is properly filed including the height of the rakers.
3. Get the best possible footing.
4. Keep a firm grip on the saw with both hands, keeping the thumb under the handle bar of the saw.
5. “Brush-out” properly. Remove all brush, limbs, chunks and debris which could contact the saw (see Figure 21).
6. Start the wedge in the backcut as soon as possible. It will act as a safeguard if the saw bar kicks out.
7. Avoid overlapping cuts in the backcut. This will cause the saw to kick out.
8. Avoid unnecessary boring. If you must bore, hold the saw firmly against the side of your body with a slight twist in the bar. Then, if it kicks out, you’ll be in the best position to maintain control. (See Figure 22).

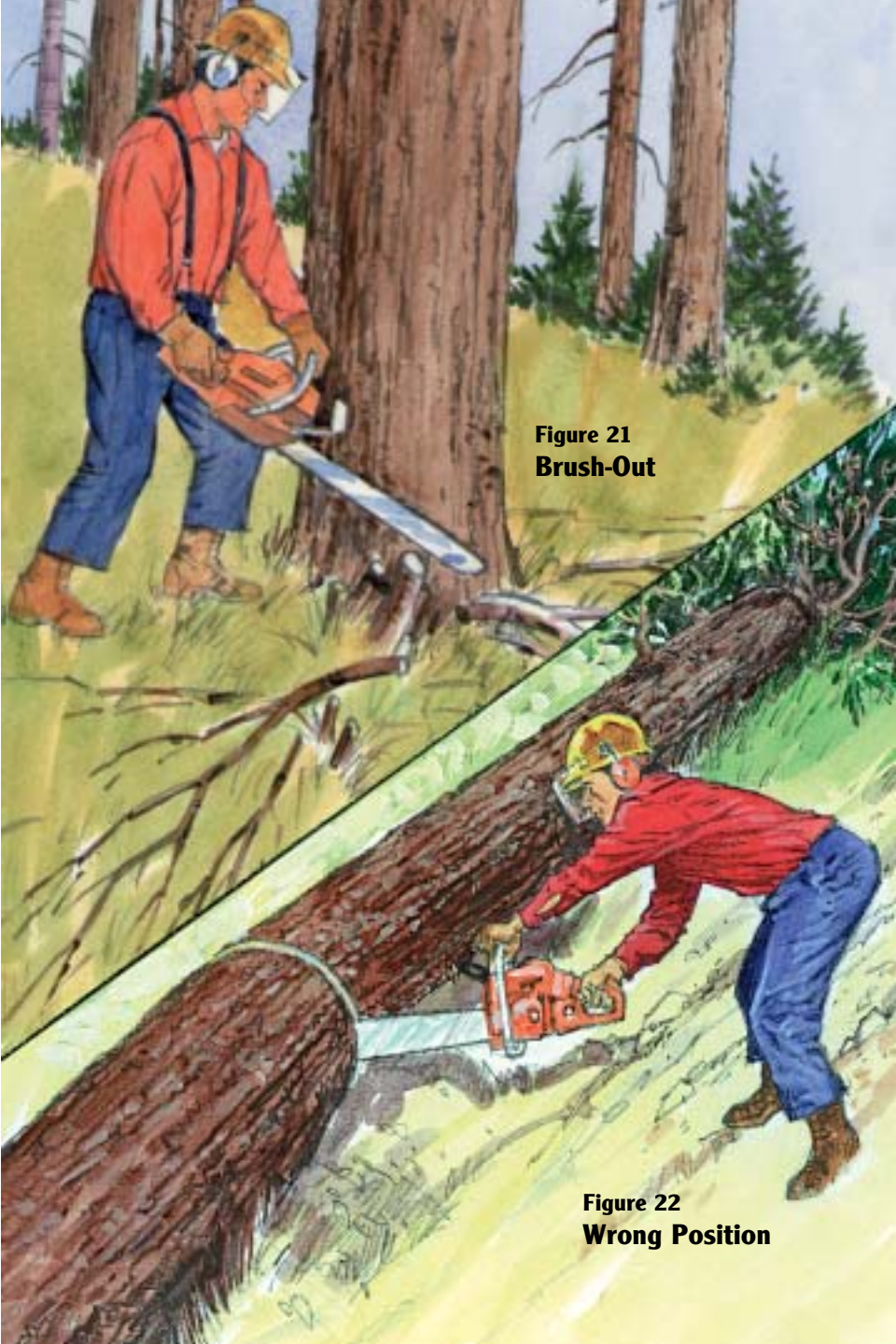


Figure 21
Brush-Out

Figure 22
Wrong Position

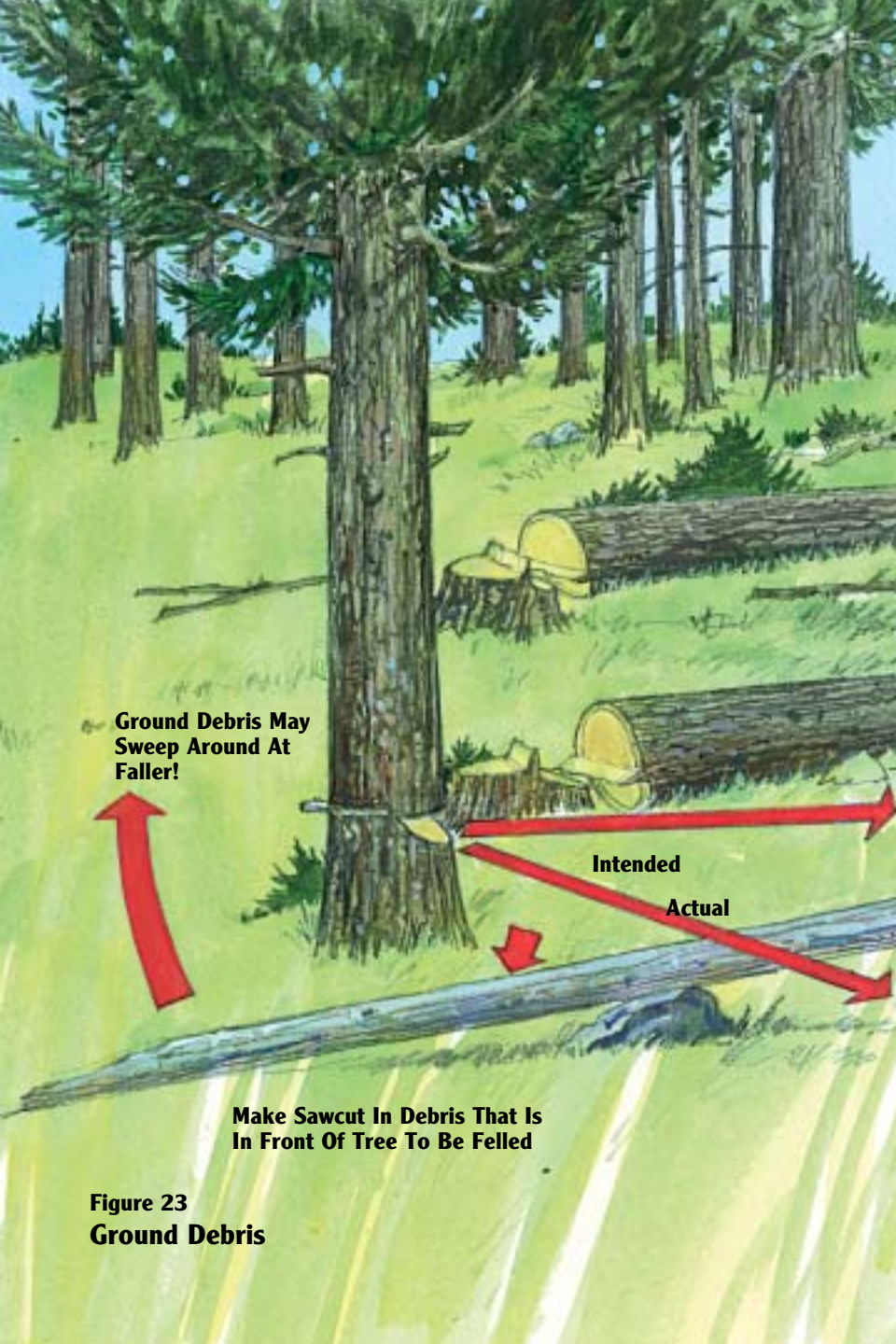
Ground Debris

Ground debris can present a serious hazard to fallers. Limbs or chunks can be thrown up when hit by a falling tree. The faller must assess the conditions and brush-out accordingly. This often means bucking trees or saplings ahead of the tree being felled.

Experienced fallers also watch for debris from above such as loose limbs, chunks or dry tops.

Recommendations:

1. Visually check the tree for loose hanging widow-makers.
2. Don't brush standing timber with falling trees.
3. Move quickly to a predetermined safe position as the tree starts to fall.



**Ground Debris May
Sweep Around At
Faller!**

Intended

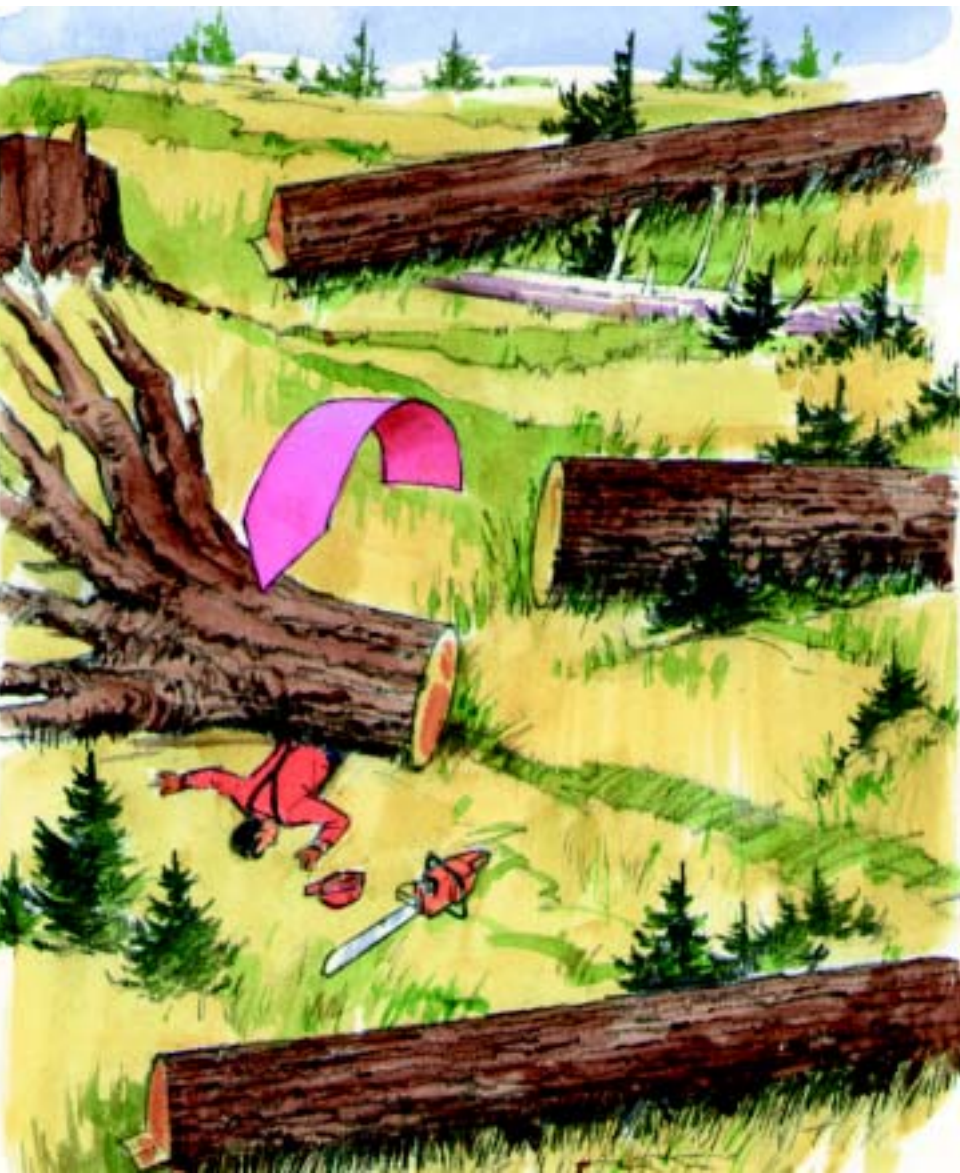
Actual

**Make Sawcut In Debris That Is
In Front Of Tree To Be Felled**

**Figure 23
Ground Debris**

Windfall Roots

Windfall roots should not be approached from the root wad side. Avoid standing directly behind or downhill of a root wad. Avoid standing on windfall roots when falling trees. Never assume that a windfall root is safe because it has been down for a long time. It may still flip over unexpectedly.



Burned Timber

Falling and bucking burned timber requires extreme caution.

- Roots of some trees could be burned off. The trees may fall as soon as they are exposed to wind. The falling face should be kept straight.
- Bark may be loosened by fire and fall unexpectedly.
- Walking on burned logs is more dangerous. Support limbs may be weakened or partly burned off.
- Burned holes and exposed roots create additional tripping hazards.
- Fire-hardened wood presents added eye hazards. Eye protection must be worn.
- Large rocks, long butts and chunks may roll downhill after fire has undermined their support.
- Burned-out centres pose additional hazards.

Right-of-way Falling on Switchbacks

When falling switchbacks on sloping ground, don't make the corners too narrow. Trees left between the switchback are hazardous to fall because of the trees and rocks piled against them during road clearing activity.

Falling such trees afterward is not only dangerous, it often results in high loss of wood because the lay is obstructed by debris. Fall switchbacks at the same time the right-of-way is being felled. Engineering staff should include these areas in their road permits.

Falling on Lower Side of Road

Widening or "daylighting" on the lower side of roadways can be a hazardous practice. The ground is often too steep to work safely. There is also the danger of loose logs or debris rolling onto fallers working in this area. The falling supervisor and the faller must assess whether the down-slope side of the right-of-way can be safely felled.

When falling quarters or strips on the lower side of the road, be aware of possible chain reactions. If logs or road debris are piled up against the standing timber, a loader or other machine must be brought in to clear the material away before you start falling.

Steep Ground

Never work directly above another faller if there is any possibility of a runaway tree, logs or debris being dislodged and rolling downhill. A roadway between you and your buddy won't always stop rolling rocks or logs.

When working on extremely steep ground, the basic safety requirements still apply: you must have a safe place to stand and an escape route. If these requirements cannot be met, another falling method must be used.

The practice of being supported or suspended by a rope to fall timber is prohibited, unless there is a safe place to stand while working, and an escape route is available and used when the tree starts to fall. A written safe work procedure must be developed and proper safety equipment must be used.

Uphill Falling

Falling timber on an uphill bias is hazardous and, if possible, should be avoided. On steep ground, trees can slide back downhill, increasing the hazard area. When required to fall trees uphill, ensure that your escape route takes you far enough away to be clear of sliding trees and flying limbs.

Stacking of Fallers

Tiering or stacking of fallers in a cutting block may only be done in areas pre-assessed by a competent falling supervisor. This assessment must ensure that there is no possibility of runaway trees, logs, or debris, which could adversely affect workers below.

Entry into a Falling and Bucking Area

A falling and bucking area is hazardous. The entire work area or strip is constantly changing. New hazards are created by the work process. These new hazards may not be immediately apparent to a person entering this area.

For example, trees with rotten or shallow roots and unstable danger trees are exposed to the elements. Wind, rain or vibration from falling trees could cause them to fall. A tree may not fall in the intended direction due to a gust of wind, and logs may slide or roll downhill.

Many tragic accidents have occurred because workers, including supervisors, entered a falling area before ensuring it was safe.

Persons Entering an Active Falling Area

Fallers and buckers must ensure that all workers are in the clear before beginning to fall or buck timber. The Occupational Health and Safety Regulation defines an **active falling area** as the area within a two tree-length radius of where a faller or mechanized falling equipment is located. You can picture this as the area within a circle centred on the tree being felled and with a radius of at least twice the height of the tree.

Only workers who have duties associated with falling and bucking are allowed to enter the active falling area. Before entering, they must receive assurance from the faller or bucker that it is safe to do so and work has ceased.

No tree shall be felled while workers are within the minimum two tree-length area. The exceptions are:

- a supervisor carrying out supervisory duties
- fallers/buckers being trained
- an experienced faller assisting another faller when a problem arises (e.g. bad danger tree, rotten-topped tree)

In these instances, all proper means of entry must be used. The faller must also be advised when the other worker leaves and by which direction.

Sometimes it's difficult for workers to make their presence known before entering an active falling area, particularly when the faller has the saw running continuously in small timber and where ground cover is dense. In such cases, workers must position themselves out of the active falling area and wait. Workers must get the faller's permission before entering the area. Accident files are full of instances where workers became impatient, entered without permission, and assumed they would be safe.

The employer must have written work procedures in place to cover and supplement the information in this manual.

The area beyond the two tree-length radius can also be hazardous. Before entering a falling area, consider tree height, possible reaction of felled and bucked timber when a tree is felled, flying debris, ground slope, subsequent danger of a "running" felled tree and rolling logs.

Before workers enter an active falling and bucking area, they must observe WCB requirements and the written work procedures governing entry and work activity in the area.

Traffic Entering the Falling Area

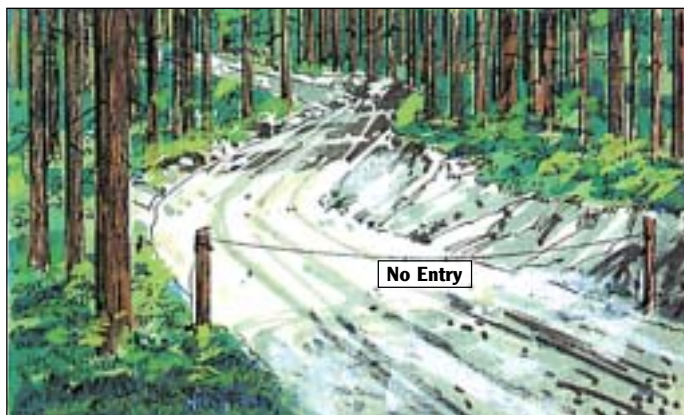
Trees may be felled near a travelled road or railroad only when the following conditions are met:

1. A minimum safe distance of two tree lengths from the road or railroad can be maintained.
2. There is no danger of trees or logs “running” toward the road or railroad.
3. Flagpersons or other effective means of controlling traffic are used.

Where a section of road is located in a falling area and is subject to limited use, traffic can be effectively controlled by using a rope barricade. The rope is strung across the road and a sign hung from the centre reading “Active Falling Area: No Admittance Without Permission.” This will give adequate warning to any unauthorized person. It’s good practice to make all barricades highly visible. Another useful method is to block the roadway with a crew vehicle and display a sign prohibiting entry.

Where the road is used frequently by vehicles hauling logs or road-surface material, barricades may not be practical. In these instances, having flagpersons positioned at either side of the hazard area, and in constant communication with the fallers, is a safe control method. Communication between the faller and the flag person is required so that traffic control can be maintained.

A sign board positioned at the side of the road is not an effective method of traffic control.



Active falling adjacent to roads may require closing the road

Logging Equipment Entering the Falling Area

In areas where log skidding is done by tractors or rubber-tired skidders, the skidding equipment and workers must be kept clear of active falling areas. This can be done by the faller moving between two adjacent strips. Falling and skidding activity can be alternated between the two strips.

Where this system of “switching” between strips cannot be followed, and falling and log skidding are carried out in the same area, both operations must be fully controlled. A larger inventory of felled and bucked timber is then required to maintain the safe minimum distance of two tree lengths between fallers and other workers.

In winter, a large inventory of felled and bucked timber may not be practical. Logs become frozen into the ground and removal is difficult. Overnight snowfall may cover the felled timber. Under such conditions, a safe work procedure must be established.

Blasting in the Falling Area

Explosives may be used near the falling and bucking area when:

- roads are under construction
- stumps on right-of-ways are being blasted
- problem trees or danger trees are being blasted
- rock quarries are being developed
- blasting signal signs must be posted

If the blasting activity is to be conducted adjacent to the falling area, or if there is any possibility (no matter how remote) that material from the blast could be thrown into any work area, effective communication with the falling crew must precede any blast. This information must include:

- nature of the blast
- exact location of the blast
- time when the blast will occur
- location where workers will be positioned as guards
- location of the place of safety which must be used until the all-clear signal is sounded

Before any blast is conducted, distinct signals must be used in accordance with WCB requirements and the employer's written procedures.

1. Immediately before the blast, 12 short whistle or air horn signals must be sounded at one-second intervals. This is done at the blast site.
2. Two minutes must pass after the last warning signal before the explosive is detonated. This allows workers to move to a safe location.
3. Following the blast, and after the area has been found safe, one continuous "all clear" whistle signal of 5 seconds duration must be sounded to signify that it is safe to begin work in the blasting area. Do not leave your safe area or enter the danger area until you hear the all-clear signal.

Every member of the falling and bucking crew must know these signals. Effective communication is the responsibility of the blaster and supervisor. Always face the blast area if you are exposed in the open or not under or behind adequate protection.

Weather Conditions

Changing weather conditions can create additional difficulties for fallers and buckers, especially when those conditions change unexpectedly. Wind, rain, fog and snow are a part of logging in British Columbia. Fallers and buckers must recognize the added hazards these elements present to a logging operation. In the written procedures and verbal instructions given to workers, there should be specific directions about difficult weather conditions.

Falling activity must be stopped when:

- directional control of trees being felled cannot be maintained
- danger trees, saplings or trees are blowing over
- flying limbs or tops are caused by high wind
- there is heavy snow build-up on limbs. This could cause limbs to break off, block the faller's view and affect directional control of the tree
- snow depth hinders the faller's safe escape from the base of the tree (Snowshoes are a possible solution to this problem.)
- excessive fog prevents the faller from seeing the entire tree being felled (How can the faller judge the lean if he can't see the tree!)

- snow depth around the base of the tree exceeds 45 cm (18 in.). The work area must first be cleared of excessive snow. Additional escape routes are also required.
- heavy rain makes it difficult to look up to judge lean or to check for hazards
- heavy rain made steep ground unstable and subject to slides
- heavy rain makes entry to and exit from the work area dangerous (roads can wash out and small creeks can become raging torrents)
- lightning storms can strike trees or cause a fire



Do not work in windy conditions



**Heavy snow impedes movement
and loads tree tops**



**Work should cease if fog
restricts visibility**

Poor Falling Practices

- Slanted falling cuts. Unprofessional and dangerous. Slanted cuts cause the tree to slide off the stump, particularly during a falling difficulty.
- Undercut too shallow, too small or undercuts not cleaned out. This will cause the tree to Barberchair when the undercut closes too quickly, or will cause excessive stump pull, butt-splits and loss of directional control.
- Lack of proper holding wood or cutting off the corners may cause loss of directional control.
- Falling through other timber when this is unnecessary. Limbs or tops could be thrown back toward the faller. Timber should be felled into the clear.
- Deliberately hanging one tree in another. The practice of hanging one tree in another to hold pressure and eliminate wedging while working on the forward tree is dangerous and prohibited.
- “Domino” falling. The practice of pushing one tree with another must be done **only** to overcome a falling difficulty.
- Working within range of a tree that has been cut-up (except work necessary to get the tree down).
- Standing under loose material while making falling cuts.
- Failing to move away quickly from the falling tree on a well-prepared escape route.
- Falling without having wedging equipment immediately available or not putting a wedge in the backcut as soon as possible.
- Falling timber during periods of high wind, dense fog, heavy snowfall or when heavy snow is on the limbs.
- Falling trees too close to adjacent fallers, other workers or equipment.

The Professional Faller



- Plans the work area



- Wears personal protective equipment



- Has respect for one's back



- Carries the saw carefully



- Cleans and brushes an escape path



- Checks for overhead hazards



- Starts a wedge in every tree as soon as possible



- Keeps one's mind on the job



- Asks for advice when necessary

Planning

There are two reasons for bucking trees into log lengths:

1. Easier handling of raw wood for logging operations and forest products converting plants.
2. Closer utilization of logs by providing log length by species and grade.

Fallers and buckers are given the bucking specifications. These may change with time and from one logging operation to another. Bucking may occur where trees are felled or in the landing (see page 86 for landing bucking).

Before starting any cut, buckers should think ahead. Plan the work by analysing log movements and other hazards that may develop as a cut log is released.

Guidelines for Bucking

- Never work in an area where bucking activity might pose a hazard to yourself or other workers. The hazard might come from falling danger trees, branches, rolling logs or the movement of equipment or material.
- Ensure all workers are clear of the hazardous area before bucking.
- Make sure all obstructions to safe bucking and all escape routes are cleared before bucking.
- Check the soundness of the log. Look for pivot points and natural skids.
- Never start a bucking cut if you consider the log to be in a dangerous position.
- Never start a bucking cut if there's a chance you can't finish it.
- Make sure of firm footing. Don't stand on loose chunks or logs with bark or material that will roll when a log is sawn off. Peel away loose bark underfoot.
- Don't stand directly behind the saw. Stand to one side of the power saw while cutting. This will prevent a blow to the body from a kickback.
- Be able to handle the saw either right or left-handed.

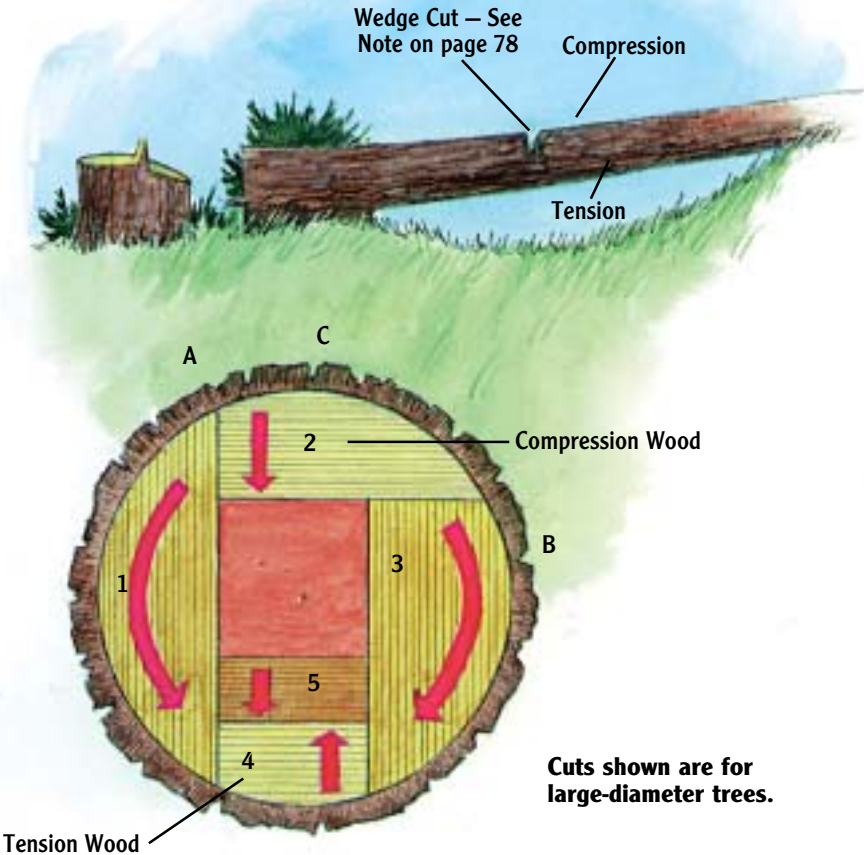
- Keep a firm grip on the saw with both hands. Instead of over-extending or holding the saw in one hand, re-position yourself.
- Choose cuts and log lengths that enable you to avoid hazards caused by a poorly-chosen cut.
- Always buck from the high side of the log.
- Never buck below logs previously bucked.
- If a tree is lying in a position that makes it too dangerous to buck at a desirable length, buck it at a double length. The employer should have written procedures to cover this situation.
- If a tree is lying in a position that makes it unsafe to measure, but where it can be bucked safely, the tree can be bucked without measuring. The employer's written procedures should cover this.
- When a falling tree brushes a danger tree, or other weak, unstable tree, leave the tree unbucked until the danger tree or defective tree is felled.
- Always be on the lookout for limbs or other objects hanging above in standing timber.
- When bucking windthrow, fall the danger trees first when safe to do so. This is to prevent rolling logs striking danger trees that may be released during bucking.
- Buck the bottom windfalls of a "jackpot" first to avoid top logs or material from rolling.
- Avoid bucking windthrow above an active falling work area.
- Windfall roots may fall backward or cartwheel after the cut has been finished. Avoid the hazard area created by the bucked root wads. Do not stand directly behind or downhill from the cut root wad.
- Watch for loose bark when working in a windfall area; it could cause a serious fall.
- Windthrown timber must be bucked in sequence to avoid the potential compression and pivoting hazards.
- If, for any reason, a log is not completely bucked, mark the log by cutting or marking a cross on each end. Then notify your supervisor who will, in turn, be responsible for notifying others who might be endangered.

Bind

Bind can be expected in most felled trees. Bind is made worse by uneven terrain and other material already on the ground. Bind can be present in combinations of top and side bind, or bottom and side bind.

Many serious accidents have occurred because fallers or buckers failed to recognize side bind while bucking. They positioned themselves on the side to which the bucked log “sprung” or swung upon release.

Figure 24
Top Bind



The best defence a buckeer has to avoid injury and equipment damage is to examine the felled tree carefully. Determine any bind which may be present and what will happen when the bucked log is released.

Top Bind (see Figure 24)

When a tree is lying in a position in which the top side is compressed while the bottom is under tension, the tree can be safely bucked without splitting, or the saw bar being pinched, by making cuts in the following sequence:

1. Cut this wood on the downhill or far side first. Dog at “A.”
2. Top cut is sawn next with Dog at “B.”
3. Turn the saw with bar tip down and Dog at “C.” Saw the close side.
4. Bore in and saw out section marked 4.
5. Cut off remaining holding wood.

The above sequence is for large-diameter trees. For small-diameter trees, use cut 2 and then cut 4.

NOTE: A wedge section could be removed when sawing cut 2 if the top bind is excessive, to allow the tree cut to close as cuts 4 and 5 are made.

Arrows indicate saw travel direction and cross-hatching indicates the heartwood that will break. Depending upon the soundness of the wood and the timber lie, it may be advantageous to use the end of the bar and bore from point “C” in making cuts number 1 and number 3 if it appears there could be danger of the log slabbing.

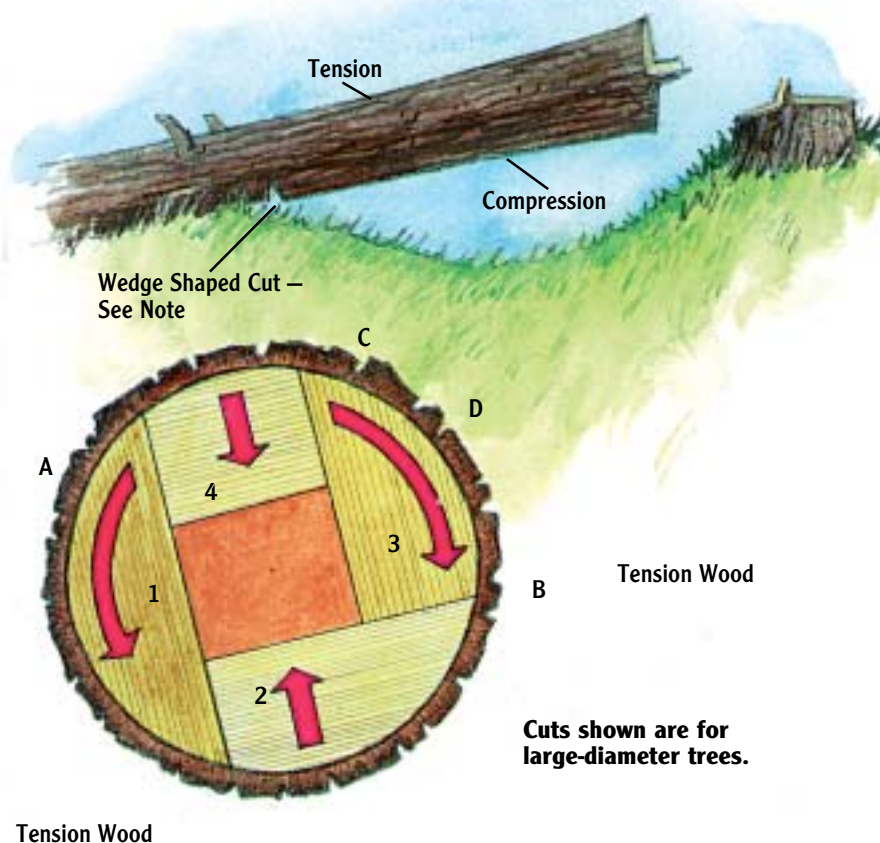
Bottom Bind (see Figure 25)

Cuts are similar to those for top bind, except top and bottom cuts are reversed.

1. Cut this wood on downhill or far side first.
2. Dog saw at “B” and underbuck.
3. Dog saw at “C” and sidecut.
4. Turn the saw and dog at “D,” cutting section 4, wedge-shaped to prevent bind.

- NOTE 1: Arrows indicate saw travel direction and cross-hatching indicates heartwood that will break. As in top bind, a wedge-shaped section could be taken out when sawing cut 2 to allow for cut closing on severe bind.
- NOTE 2: For small-diameter logs, cuts number 1 and 3 may not be necessary. Use cut 2 and then cut 4. Take out a wedge shape if there is heavy bind.

Figure 25
Bottom Bind



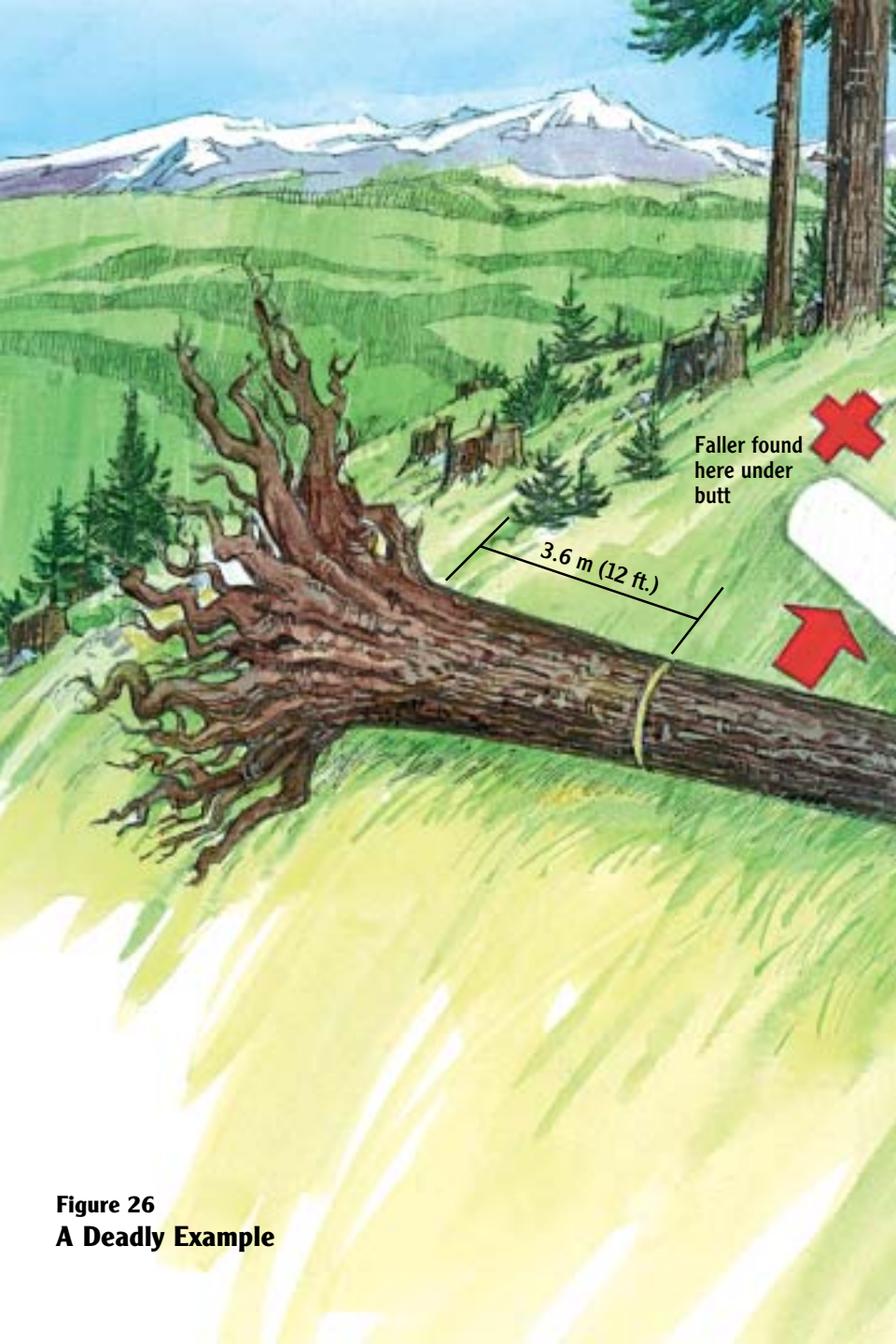
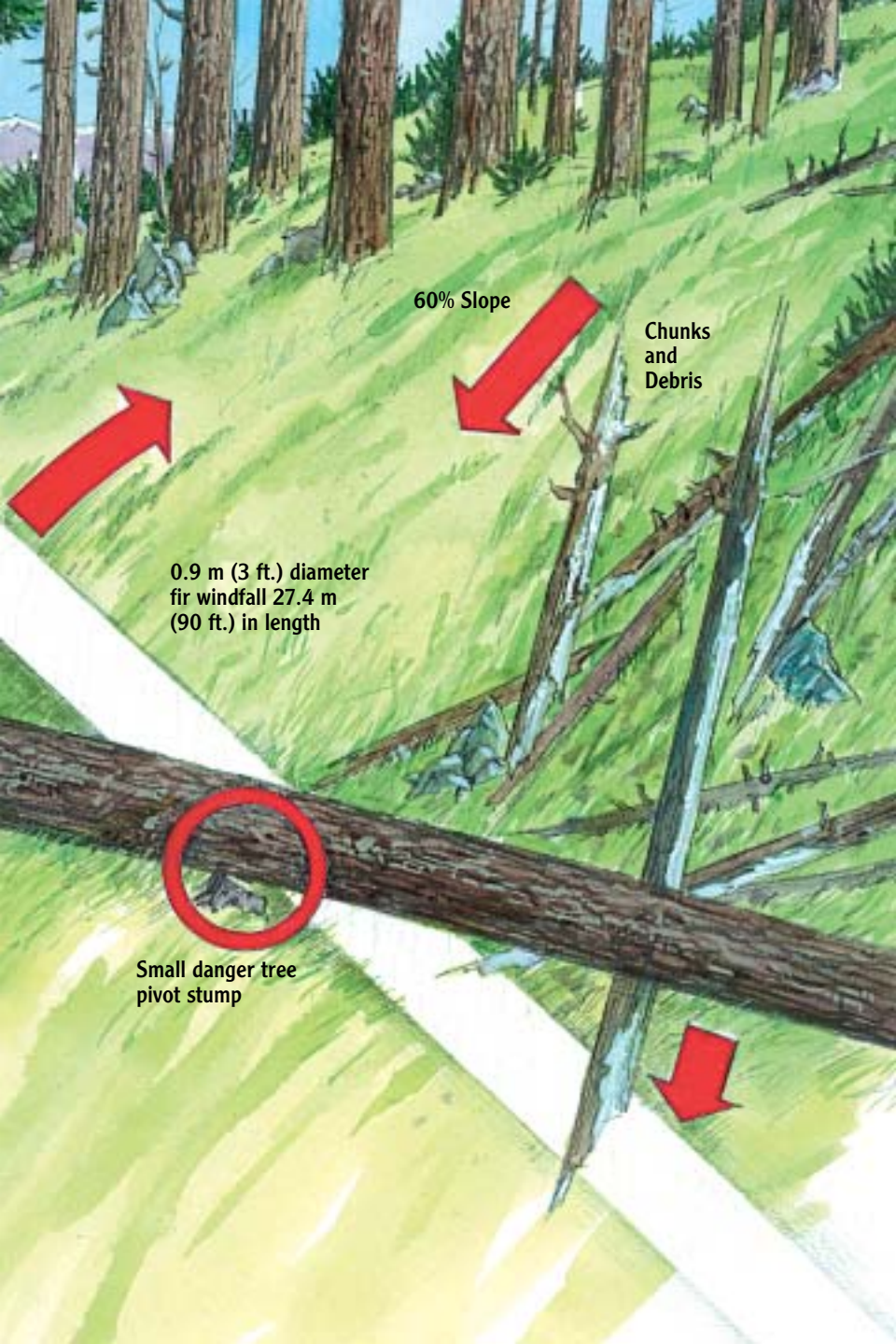


Figure 26
A Deadly Example



60% Slope

Chunks
and
Debris

0.9 m (3 ft.) diameter
fir windfall 27.4 m
(90 ft.) in length

Small danger tree
pivot stump

Pivot Points

A pivot point is any feature on the ground that may cause a falling tree or log to react in an unexpected manner. Pivot points can be stumps, rocks or any protrusion that affects a log's balance or natural tendency to roll. They're usually encountered in bucking and can be dangerous if not recognized.

As a bucked log is released, an unseen pivot point could cause one end of the log to slide or roll downhill and the other end to move uphill. If the buckler hasn't noticed the pivot and planned accordingly, a serious injury could result.

A Deadly Example (see Figure 26, pages 80, 81)

The faller was killed when the windfallen tree he was bucking swung uphill, crushing him under the butt. The windfallen fir tree, 0.9 m (3 ft.) in diameter by 27 m (90 ft.) in length, was lying across a steep sidehill. The butt end was rooted while the small end was resting on chunks. The faller made the first cut 3.6 m (12 ft.) from the root. He didn't notice the fir was resting on a small pivot stump.

Expecting both the tree and root to roll away from him, he finished the cut from the uphill side, standing to the left of his saw. As the cut was released, the small end of the tree slid quickly downhill and the butt end swung uphill. It crushed the faller and carried him up the slope on his back.

The subsequent accident investigation showed the faller hadn't noticed the small danger tree stump located directly under the windfall about 9.2 m (30 ft.) from the root.

If he had noticed the pivot point, the faller could have taken appropriate precautions. In this case, he would have three choices:

1. Buck the windfall at or near the pivot point.
2. Start bucking the windfall from the small end, leaving the tree anchored at the root.
3. Stand on the right-hand side of the saw when bucking off the root. If the butt swings uphill when the cut is released the faller is in the clear.

Before starting any bucking cut, analyze log movements and other hazards that might develop as the log is released.

Bucking Large Logs

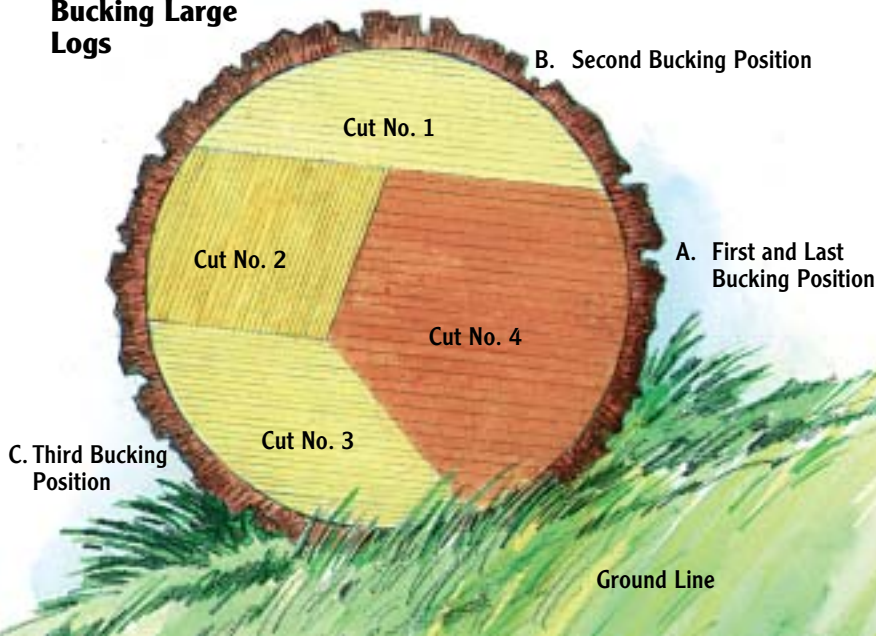
In cutting large logs, buckers have a tendency to buck off as much of the far side of the log as they can be reaching over the side from the top of the log (see Figure 27, “B,” No. 2 position). This practice often results in a section of the lower left side of the cut remaining unbucked. Leaving saw cuts in unbucked wood may injure rigging crew members.

Figure 27 shows a safe method for bucking large logs.

1. Saw into the top of the log about 300 - 350 mm (12 - 14 in.) from Position “A.”
2. From Position “B,” cut off the lower side of the log right into the heartwood.
3. From Position “C,” cut off all remaining wood on the low side of the cut.
4. Return to safe Position “A.” Cut off balance of wood to complete the cut.

The bucker must carefully size up log lie and condition before taking the third bucking position. Think ahead. This will prevent any dangerous, unforeseen events.

Figure 27
Bucking Large
Logs



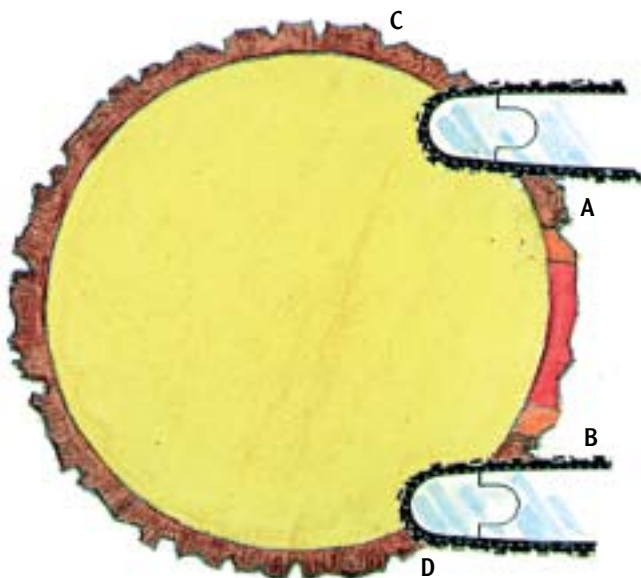
Boring

Boring is useful in certain specific situations when falling heavy leaners, for example, or in bucking where there is excessive bind. However, boring can be dangerous. If proper procedures aren't followed, boring can cause severe kickback.

Points to Remember:

- Make sure of firm footing.
 - Keep both hands on the saw.
 - Twist the bar slightly when the cut is started.
 - Hold the saw close to your body, but still to one side.
 - Don't bore unnecessarily.
1. Don't bore into the log between A and B. This area has the highest potential for kickbacks.
 2. Start in C to A with bottom of bar and D to B with top of bar. Work towards B to A if necessary.

Figure 28
Boring



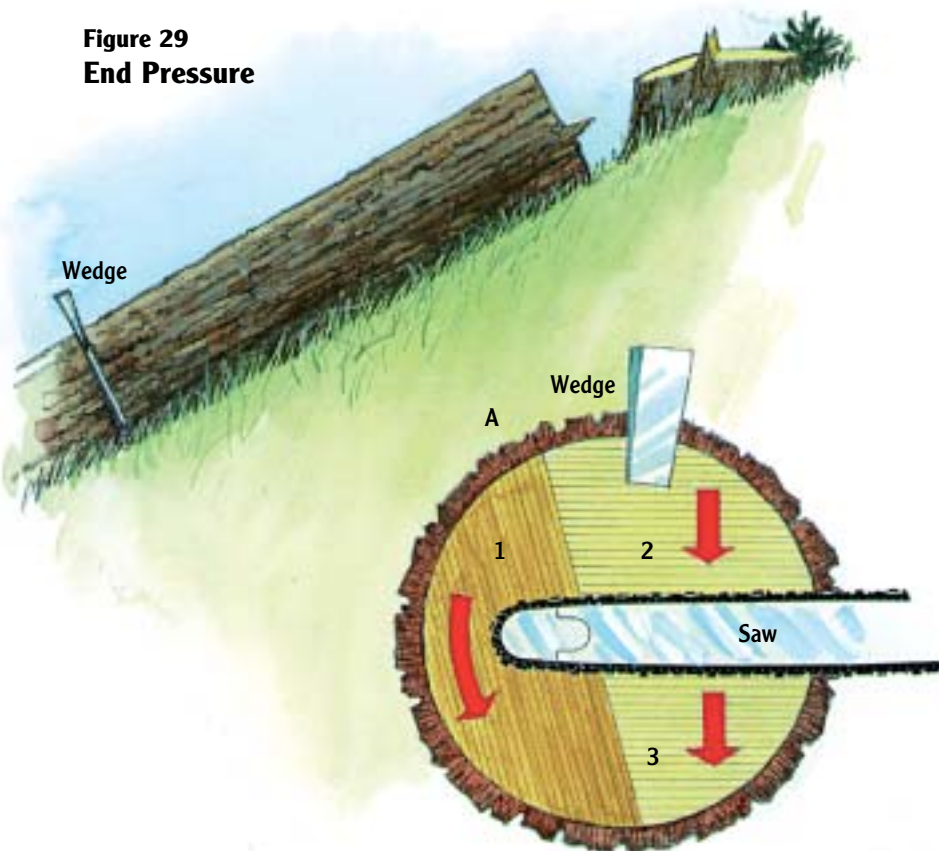
End Pressure

When a tree is lying flat on steep terrain, straight up and down the slope, a bucked log has a tendency to slide down. This causes the saw bar to be pinched as the log is bucked off. Matching top and bottom cuts can be made without end pressure on the bar by inserting a wedge (see Figure 29).

1. Dog saw at "A" and cut section 1.
2. Leave saw in the cut and cut around to the position shown. Tap in wedge as soon as possible.
3. Cut remainder straight down.

NOTE: The entire cut can be made without removing the saw. The wedge can be tapped out after cutting is completed.

Figure 29
End Pressure



Landing Bucking

Buckers are also used in ground skidding and high lead logging operations where full-length trees are brought into the landing. Landing buckers are exposed to additional hazards, therefore they must take additional precautions.

Guidelines:

- Wear a “hi-vis” vest while working on the landing or anywhere near moving machinery or equipment.
- Pick a safe area to work on your saw. Saw maintenance, filing and refuelling should be done in full view of equipment operators.
- Notify equipment operators if you decide to change your safe work area.
- Stay in your safe area while waiting for trees to buck and while incoming skidders are moving on the landing.
- Stay in your safe area while turns are being yarded to the landing on high lead logging operations.
- Never turn your back on moving equipment or machinery. Stay clear of swinging yarders and loaders.
- Wait until trees have been spread out or placed in a safe location for bucking.
- Wait for the “go ahead” signal from the machine operator before starting to buck.
- Don’t buck trees that are piled or crossed-up. The bucked logs could roll or slide.
- Finish bucking cuts from the high side on sloping landings.
- Stay in full view of the loader operator while bucking. Don’t work on the off-side of a logging truck while it’s being loaded.
- Always make sure other workers are clear of the hazardous area while bucking is in progress.

Common Bucking Difficulties

Bucking on Sidehills

While on sloping ground there is always a chance the log may roll after being bucked. Watch for limbs that could spring out as the log is released. These limbs have, on occasion, hit buckers and even hooked their clothing as the log rolled.

Trees and Limbs Bent Under Logs

If bent limbs and saplings are not cut off before the felled tree is bucked, they may fly up as the log rolls away. Small trees growing on windfall roots should also be cut off first. They could be forced into your bucking position when the root drops.



Incomplete Bucking

This could be a hazard for skidding or rigging crews. Both ends of the log should be marked with an X.

Log Dropping While Bucking

The log may drop on the buckner, or dislodge other material.

Underbucking should be finished with the saw chain in the standard position. This will also allow the cutting chain to be kicked out as the cut is completed.



Kickbacks

Many bucking injuries are caused by saw kickbacks. You can reduce saw kickbacks when bucking by following these rules:

1. Get the best possible footing.
2. Brush-out where the cut is to be made.
3. Cut brush and bent limbs before bucking. This stops the material from throwing the saw as the cut is released.
4. Don't reach out too far with the saw (see Figure 22). Trying to extend your reach by holding the saw with one hand is a dangerous practice. The position is too unstable.
5. Don't stand directly behind the saw when bucking (see Figure 30). Don't straddle the saw.
6. Learn to buck left or right-handed so you position yourself out of the kickback path of the saw.
7. If you are bucking logs larger in diameter than the length of the saw bar ("beaver tailing"), watch for kickbacks. As soon as the bar tip is buried the chance of a kickback increases dramatically. Re-position your saw or take extra precautions against kickback.
8. When making boring cuts, hold the saw firmly against the side of your body. If the saw kicks out, you'll be in the best position to maintain control.
9. Avoid unnecessary boring.
10. Use wedges on large cuts (750 mm (30 in.) or more).

You can reduce saw kickbacks when limbing by following these rules:

1. Use enough bar when limbing. Remember: the end of the bar and chain causes most kickbacks (see Figure 31).
2. Be ready for limbs under tension. These may try to flip the saw toward you as the log is sawn off.
3. Avoid touching other limbs with the backside or nose of the chain.
4. Make sure the chain stops when the saw is idling.
5. Stop the motor when moving any distance. This will prevent brush from hooking the trigger, which could cause the chain to speed up and possibly cut you.

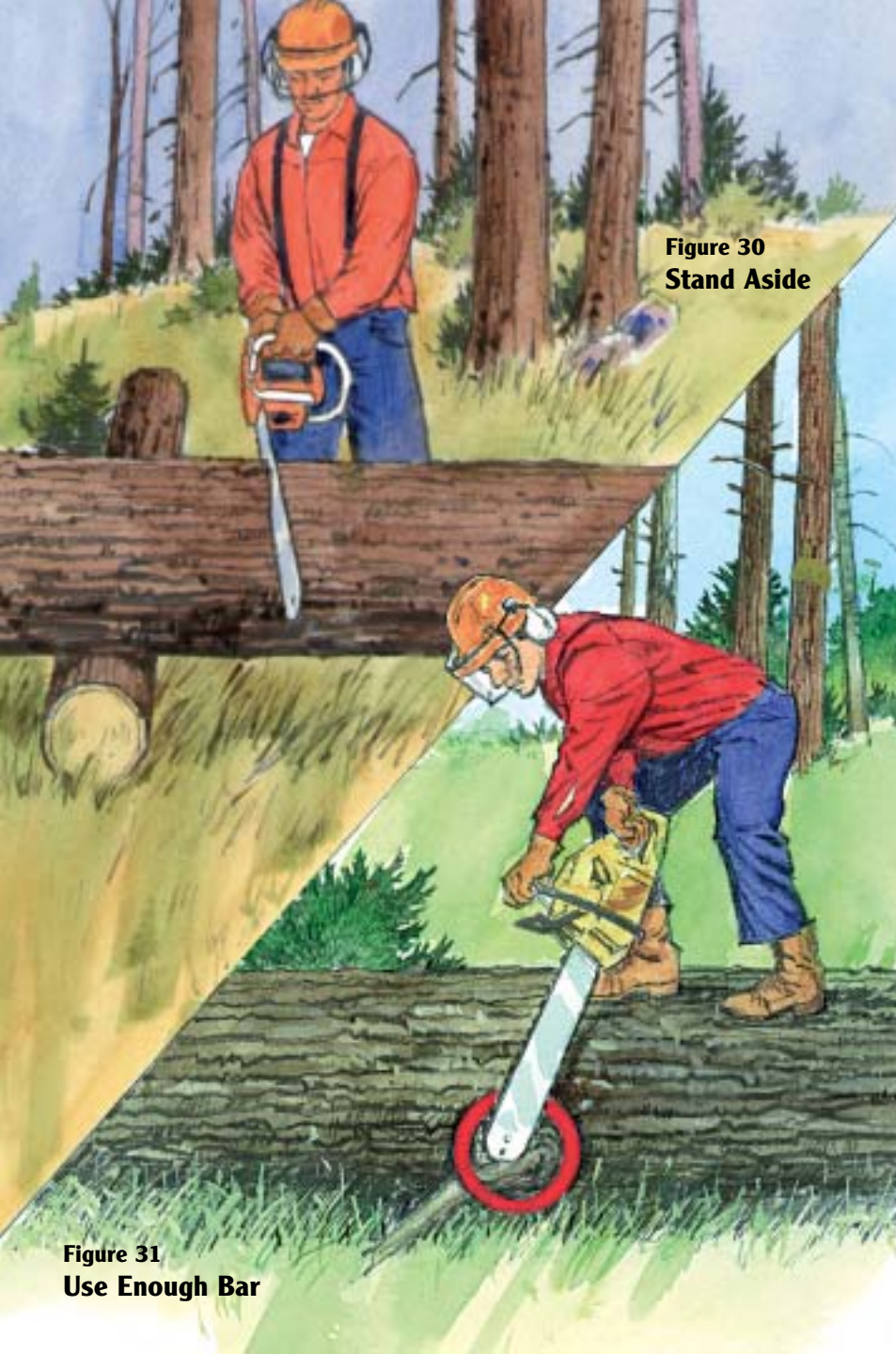


Figure 30
Stand Aside

Figure 31
Use Enough Bar

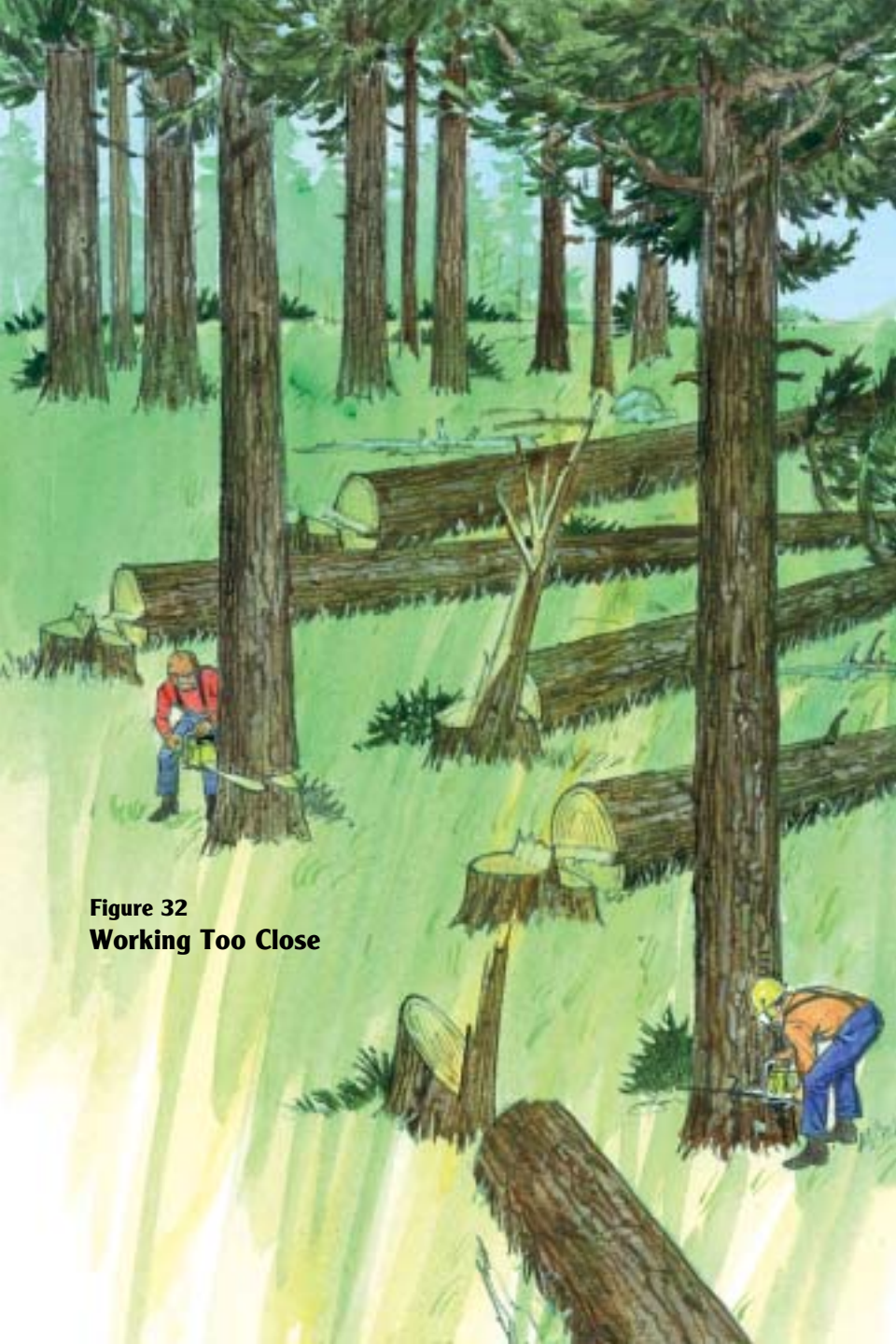
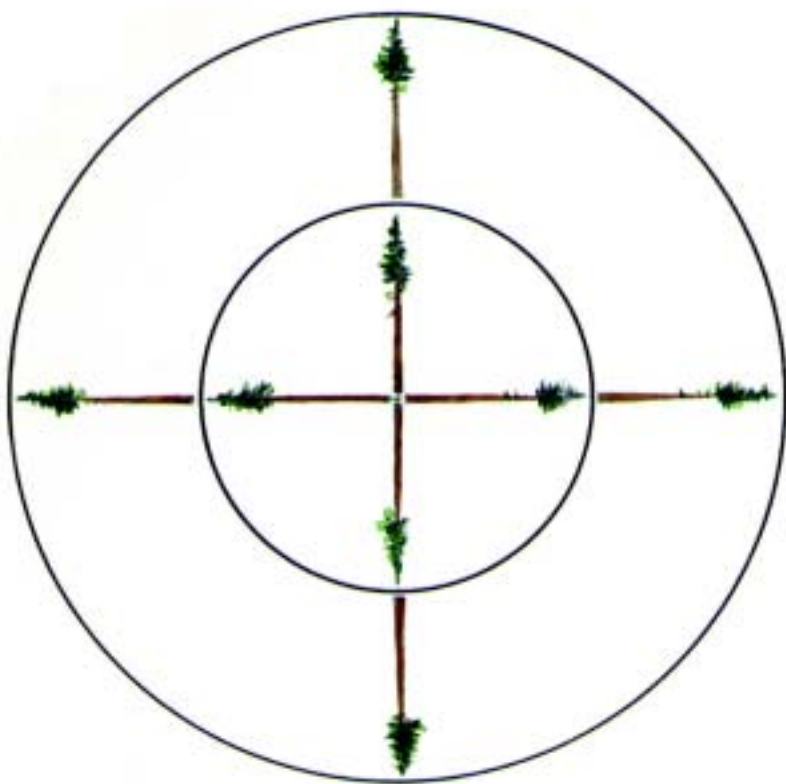


Figure 32
Working Too Close

DANGEROUS WORK PRACTICES

Working Too Close

The dangers of working too close cannot be overemphasized. Too many fallers, buckers and other workers such as skidder operators have been killed when struck by a falling tree when they entered the two tree-length area while falling was in progress. Working too close is the sign of a poorly organized operation, and shows a lack of proper planning. Never enter the two tree-length active falling area of another faller's work area.



Bypassed Danger Trees

Bypassed danger trees may fall because of:

- wind
- vibration of felled trees striking the ground
- vibration through tractor movement
- chain reaction of logs, debris or rigging during skidding activities
- contact by skidding equipment
- contact by felled trees

Bypassing danger trees is extremely dangerous to all workers. There have been many fatal accidents involving fallers, landing buckers, skidder operators, chokermen and others because danger trees were left standing in an active falling and bucking area.

Pushing Danger Trees

Pushing danger trees with green trees instead of falling them is extremely hazardous. The top of the danger tree may break off and “jackknife” back onto the faller (see Figure 34, pages 96, 97). The whole danger tree could sway and fall back onto the faller. Never push a danger tree with another danger tree.

Most danger trees must be felled progressively with other timber. If you encounter danger trees, follow your employer’s written work procedures.



Figure 33
Bypassed
Danger Trees



Figure 34
Pushing Danger Trees



Cut-Up Trees

A cut-up tree is any tree that has had its stability compromised by a saw, an axe, or any other tool, and has had more than one-third of its structural integrity removed.

Many investigations of serious and fatal accidents reveal that fallers who were injured or killed had cut-up trees in their working area. The cut-up trees were sitting back on a wedge or on the stump until one of the trees fell unexpectedly. The practice of pushing a cut-up tree (with wedges set) can only be undertaken to overcome a falling hazard, not for expediency. Domino falling of timber is prohibited.

Cut-up trees are an extreme hazard. The cut-up trees may fall because of:

- unexpected wind shifts
- vibration of other trees being felled
- vibration of moving equipment
- contact by yarding equipment
- contact by another falling tree



Figure 35
Cut-Up Airbound Tree and Leaner

Hang-Ups

Again, many fatality investigations reveal that the fallers involved had created many “hang-ups” in their area. They were working under one of these hang-ups when struck by it.

Hang-ups are caused by:

- poor planning of the work area
- loss of directional control

Losing control of the falling tree can be caused by:

- cutting off the corner of holding wood
- stump pull or rot
- undercuts not cleaned out
- wind
- failing to use wedges where required

Hang-ups can be prevented!



Proper method of blocking tree down



Figure 36
Hang-Ups

Domino Falling

Domino falling is an extremely dangerous work practice. Usually confined to small timber, it has taken many lives in the logging industry.

Accident investigations have revealed that, in some cases, fallers had more than 15 trees cut-up and left standing. In each case, the faller intended to push the cut-up trees over with a pusher tree. Unfortunately, one of the cut-ups came down unexpectedly.

In some cases, the cut-up tree came down and killed the faller before he was able to drop the pusher tree. In others, the pusher tree caused one or more of the cut-up trees to fall back on the faller.

The need to domino fall trees can be avoided by proper planning. Locating skidroads to take advantage of the general lean of the trees can eliminate domino falling.

Domino falling is dangerous. Don't do it.



Figure 37
Domino Falling

Figure 38
Inadequate Falling Cut



Unintentional Dutchman or Unclean Undercut

No Undercut

All fallers, even those with years of experience, are often caught by Barberchairs and kickbacks because they failed to put in an undercut.

Some believe their saws are fast enough to cut through a small tree before a Barberchair can occur. This is not true, as it only takes one mistake in judgement. The consequences of that mistake can be fatal.

One fatality investigation showed that the faller had tried to bring down a one-meter (40-inch) cedar without an undercut.



Figure 39
No Undercut

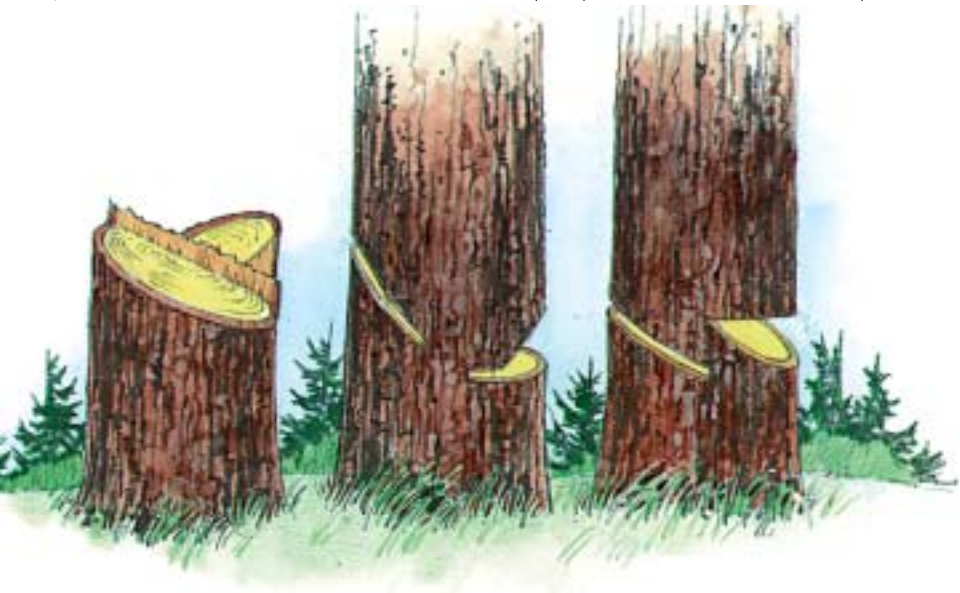
Poor Falling Practices

- criss-crossed undercuts and backcuts
- no undercut
- backcut below undercut
- sloping backcuts
- inadequate undercut
- Dutchman
- failure to use wedges
- no getaway path (escape route)
- failure to brush out trees to be felled
- hang-ups (poor falling practices)
- cut-off corners of holding wood

Figure 40
Poor Falling Practices

Sloping Cuts

Backcut Below Undercut



ROLE OF THE WCB

The Workers' Compensation Board is responsible for promoting safety and health in the workplace. The WCB inspects worksites and enforces safety standards and requirements in virtually every industry in British Columbia.

When a worker is hurt on the job, the WCB pays the individual for lost wages and helps during recovery with medical aid and physical rehabilitation.

When injured workers are unable to return to their jobs, the WCB will assist in their retraining. If a worker is fatally injured on the job, financial help and counselling are made available to the family.

The WCB examines and certifies all Occupational First Aid attendants, blasters, and seafood harvesters in the province. It also funds research into many occupational safety and health problems – Vibration White Finger Disease (Raynauds Syndrome), for example.

These services are free to B.C. workers. B.C.'s compensation system is funded entirely by the employers of the province.

In the logging industry, the WCB's representative in the field is the Occupational Safety Officer (OSO). Many OSOs are former loggers. They know the hazards of the job and they know what can be done to reduce the risk of injury.

More than just an inspector, an OSO is a safety professional. The duties of an Occupational Safety Officer include worksite inspections, audits of safety programs, crew talks, seminars and educational presentations on regulation compliance, recognition of hazards, safe work practices, and investigation procedures for fatal and serious accidents.

B.C.'s logging industry is a dangerous business. The accident statistics confirm that. But it doesn't have to be. If fallers, buckers, supervisors, employers and WCB Safety Officers all work together, the number of workers hurt in the woods can be reduced.

GLOSSARY

Active Falling Area	The area within a two tree-length radius of where a faller or mechanized falling equipment is located.
Backcut	Final falling cut. The backcut will progress until the tree starts to fall in its intended direction.
Bar or Blade	That part of the chainsaw upon which the cutting chain travels.
Barberchair	The configuration of a tree stump (shaped like a chair) resulting from a tree splitting as it is felled; usually the result of poor falling cuts.
Beaver-tailing	Burying the whole bar of the saw while cutting.
Bed	The intended position in which a tree will be felled.
Bind or Bound	Compression created in a cut in a tree or log due to uneven terrain or contact pressure from other trees or logs.
Brush-out or Swamp-out	To clean out brush and other material around the base of trees to be felled or logs to be bucked. Gives protection against saw kickback and provides safe footing.
Buck or bucking	To saw log lengths from a tree after it has been felled.
Bullbucker	A foreman or supervisor of falling and bucking operations.
Cat-face	Deformed tree trunk surface usually caused by rot.
Clear-cut	When all trees in a given area are felled.
Corners	1. Left and right side of the holding wood. 2. Corner of the falling “face.”

Crossing the Lead	Falling a tree at an angle across the established lead or falling pattern.
Cull	A tree or log considered unmerchantable because of defects.
Cut-up	Tree or log left standing or suspended with the falling or bucking cuts almost completed.
Rigging Cut or Weakening Cut	A tree may be lying in such a position that a normal bucking cut cannot be made safely. In order to facilitate yarding or skidding, the faller will make partial bucking cuts from a safe position, perhaps two log lengths apart.
Danger Tree	Any tree that is hazardous to workers because of location or lean, physical damage, overhead hazards, deterioration of limbs, stems or root systems. Also called <i>dangerous tree</i> .
DBH	Diameter at breast height.
Dogs	Pointed teeth located between the chainsaw bar and motor. Used in falling or bucking to pivot saw and maintain position while cutting.
Domino Falling	Placing undercuts and backcuts in a series of trees, then “pushing” them with another tree. Domino falling is a dangerous, unacceptable practice.
Dutchman	Portion of the undercut not removed. Use of a Dutchman can cause loss of directional control and in the case of “unintentional Dutchman” or unclear undercuts, a Barberchair. A Dutchman is hazardous because it can change the falling direction of the tree.
Escape Route	A planned and brushed-out path used by fallers to make their way into the clear when the backcut is completed.

Face	Edge of area formed along standing timber as timber is felled.
Faller	Timber faller-bucker (coastal) or tree faller (interior).
Hang-up	A partially-fallen tree supported by other standing timber. Hang-ups are dangerous and can be natural or man-made.
Holding wood	Hinge of wood left uncut between the back of the undercut and the backcut.
Jackpot	A pile of haphazardly felled trees.
Kerf	The width of any saw cut.
Kickback	1. When the chainsaw is jerked out of the faller's control (a common cause of saw cuts on the arms and legs). 2. When a tree being felled slips backwards off the stump toward the faller.
Lay	The position in which a felled tree is lying.
Lead	The established direction in which all trees in a quarter or strip are to be felled, usually governed by the terrain of the area, or its general slope or skid road system.
Lean	Outward slant of a tree with reference to its base.
Leaner	A tree that leans excessively, not growing straight.
Lily pad	A thin slice of wood, sometimes taken off the stump and used to cover the saw if it's to be left out.
Long Butt	After a tree is felled, a section of the butt end is sawn off because of rot or other defect.

Offside	1. Side of tree opposite to which the faller stands when falling or bucking. 2. Side of body opposite to the side that you normally use to hold the saw.
Pushing	When a tree has been undercut and backcut and will not fall, the faller may as a last resort “push” this tree by falling another into it.
Quarter	That area or portion of standing timber assigned to a faller. Typically a coastal logging term.
Riparian	Area of stream or riverbank.
School-marm	A tree stem that branches into two or more trunks or tops.
Set	May consist of one faller who falls and bucks timber or one faller and one buckner working as a team. Sometimes used to describe right-of-way fallers. (The term was more common in the “hand” falling era. Two fallers and one buckner formed a three-man set or gang.)
Set-back	Occurs when a tree settles back opposite to the intended direction of fall.
Side-notch	Additional side saw cuts made to prevent Barberchair or to facilitate sawing large trees into logs.
Sidewinder	A tree that falls sideways into standing timber, instead of in the desired direction.
Spiked Top	The top of a tree may die and lose its branches, leaving a tall, dry spike of dead wood. Usually occurs in cedar.

Springboard	Board with bolted steel “nose” placed in a notch and used as a platform to allow the faller to work above a large butt or for use while falling timber on very steep terrain.
Staggered Pants	Faller’s pants are maintained without cuffs and are shortened to prevent tripping.
Strip	Area allotted to each faller; same as “quarter.” Typically used in Interior logging.
Tang	Sharp or pointed end of chainsaw file.
Undercut	The wedge or section of the tree’s base sawn out to allow the tree to fall in a chosen direction. A good undercut is usually about one-third of the tree’s diameter.
Widening or Daylighting	Taking an additional strip of timber off the right-of-way or quarter after the road is in.
Widow-maker	Limb or other loose material dropped or thrown from a tree toward the faller as the tree is felled; a constant hazard for fallers.
Windfalls/ Windthrows	Trees blown over by the wind. Windfalls are often found lying among standing timber. Some are still merchantable.

ESSENTIALS OF OCCUPATIONAL FIRST AID

1. Make sure there is no danger to you or further danger to the patient.
2. Determine level of consciousness.
3. Check for breathing. If patient is not breathing, administer mouth-to-mouth resuscitation using a pocket face mask.
4. Check for pulse. If no pulse is found, begin CPR at once and continue until medical help arrives or until pulse returns.
5. Check for bleeding. If bleeding is present, apply pressure over the wound to stop blood flow. Apply a pressure dressing.
6. Keep the patient warm.
7. Get help as soon as possible.

Don't change the person's position unless you have to. You may need to move the injured person to protect him or her and yourself from further threat of injury or if it's necessary in order to clear the airways.

Occupational first aid will help keep the injured person breathing, and bleeding controlled until qualified help arrives.

