A Guide to Safety in

Tree Felling

and

Cross Cutting

OCCUPATIONAL SAFETY & HEALTH SERVICE
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DEPARTMENT OF LABOUR
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Contents

About This Booklet

MANY New Zealand farmers and home handypeople fell trees — to clear land, to provide fencing for farm and garden, to provide logs for timber, to open up sections, to let sun into buildings or crops, or for firewood.

Once felled, the trees are cut for ease of handling, whether for logs and produce, for disposal by dumping or chipping, or for burning as firewood.

The Occupational Safety and Health Service (OSH) is concerned at the number of people who suffer accidents while tree felling and crosscutting and has produced this booklet for the guidance of those who are inexperienced in this work. It is not intended for the professional whose work is covered by detailed safety codes.

This booklet outlines the safe practices that have evolved in, and are endorsed by, the New Zealand logging industry.

In the first section, there are details of preparation for the felling operation, information on correct tree felling and crosscutting methods, tips on how to overcome simple problems that may occur, and advice on tasks that you should not tackle unless you are trained and experienced.

The second section contains advice on work that should be undertaken by experienced people only. This includes tree driving, back pulling, working in windthrow areas and felling heavy leaners.

Before you do any tree felling or crosscutting, you should be experienced in the use of chainsaws. If you're a novice, it's sensible to get training from a qualified person or to have an experienced person guide you through the procedures and make you aware of hazards.

Training may be available from your chainsaw dealer or a qualified instructor in your area. OSH forest operations inspectors frequently run courses on chainsaw use for the public or special groups.

This booklet has been produced as a companion to the OSH publication *A Guide to Safety with Chainsaws,* which is available at all OSH offices. Keep the two booklets together with your chainsaw instruction manual for easy reference.

SECTION ONE:

TREE FELLING AND CROSS CUTTING

Preparing For Work

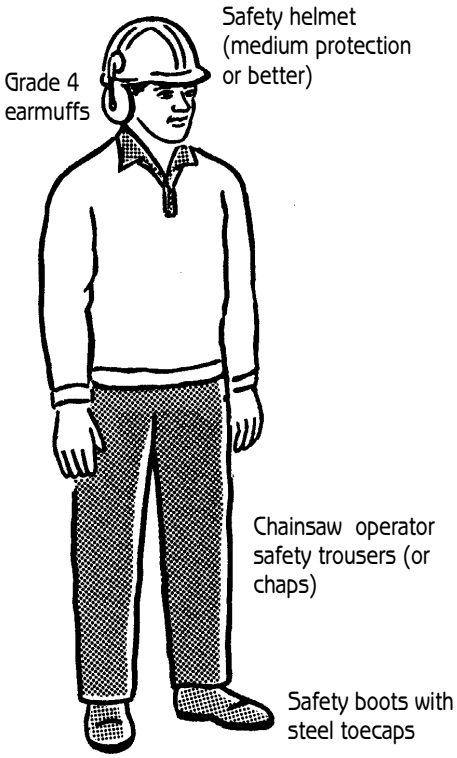
YOU should only undertake felling and crosscutting of trees if:

- You are physically fit and reasonably active.
- You are trained or experienced in the use and maintenance of chainsaws.
- You have been trained in or are experienced in felling and crosscutting of trees; or
- You are being trained on a one-to-one basis by a competent person.
- You have a person with you who is able to assist or obtain help in an emergency. Never work alone while felling trees or using a chainsaw.
- You are not under the influence of drugs or alcohol or are tired or fatigued.
- You are fully equipped to carry out the job.

WHAT YOU NEED

Let's check the equipment you'll require. You need:

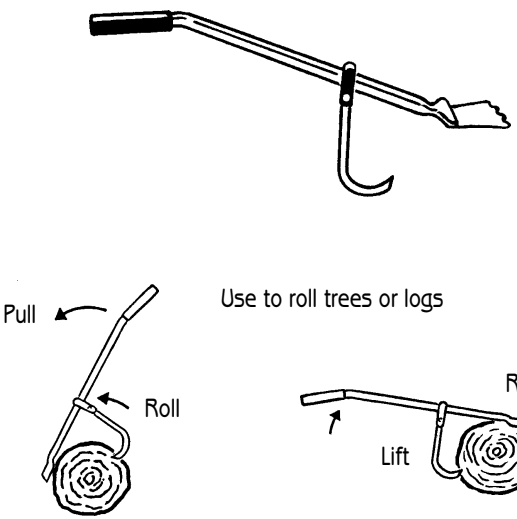
- Personal safety equipment, as described in the OSH *Guide to Safety with Chainsaws* and shown in the illustration. Don't forget your first aid kit.



Personal safety equipment.

- Chainsaw, files and guides and tool kit. Your chainsaw manufacturer's booklet.
- Fuel and oil containers that are properly constructed for the purpose. Don't use glass or soft plastics.
- Wedges and driving tools. Have at least two wedges. High-density plastic or soft metal are best.
- Canthooks. These are handy for rolling small trees, or rolling and holding logs to assist with crosscutting.

- A felling lever. This is useful for small trees, and one with a hook can be used as a canthook.



Felling lever with hook.

- An axe. You may prefer to trim with an axe. It's also useful for splitting large firewood blocks.

Know Your Limitations

THERE are some felling methods and situations that should only be tackled by experienced tree fellers or professionals. While some are described later in the booklet, they are listed here for your guidance.

These are jobs for experienced people only:

- Working in windthrow or with wind-affected trees.
- Felling large, heavily branched shelterbelt trees.
- Felling trees with a heavy lean.
- Felling trees that are liable to splitting or slabbing. Willow and tawa are two examples of such trees.
- Felling trees on steep slopes or unstable ground.
- Working on or felling trees that overhang powerlines, buildings or public access ways.
- Driving trees one on to another.
- Back pulling trees.
- Felling dead trees.

Preparation For Felling

THERE are two main things to consider when preparing for felling— the general work area and the individual tree to be felled.

CHECK WORK AREA

It's important to check the work area for hazards before you start felling or cutting. Under the Health and Safety in Employment Act 1992, you are required not to do anything that will harm another person in any place where you work (this includes harm to yourself).

- Check that there are no other persons, children or animals in the work area. Make sure that no people with you, unless acting as an instructor or assistant, are within two tree lengths of the tree to be felled. This distance should be increased if felling is downhill.
- Check for hazards in the area such as electricity or tele-communication lines. Seek advice from the local controlling authority if in doubt.
- If any road, railway or public access way is within two tree lengths of your work area, contact the controlling authority to find out what precautions they require

to prevent harm to other people and property.

- Check there are no buildings, equipment, fences or above-ground reticulation pipes within two tree lengths of the direction of fall of the tree.

With checking completed and precautions taken as necessary, you're now ready to look at the individual tree to be felled.

ASSESS TREE TO BE FELLED

- Where possible, plan to fell the tree so that it clears any obstructions and falls into a clear, open space.
- Check for any dead or broken branches or any debris that may be dislodged and fall into the work area as the tree falls. This is particularly common in old shelterbelt trees and causes many serious accidents every year. View the tree from different angles so you don't miss anything.
- Look for branches interlocking with branches of other trees. These can break off as the tree falls and drop into the work area, pull the tree away from the desired direction of fall, or cause other trees to uproot and fall.
- Note any vines which may affect the direction of fall.
- Look for any rot around the base of the tree where the felling cuts are to be made. These may affect

the direction of fall.

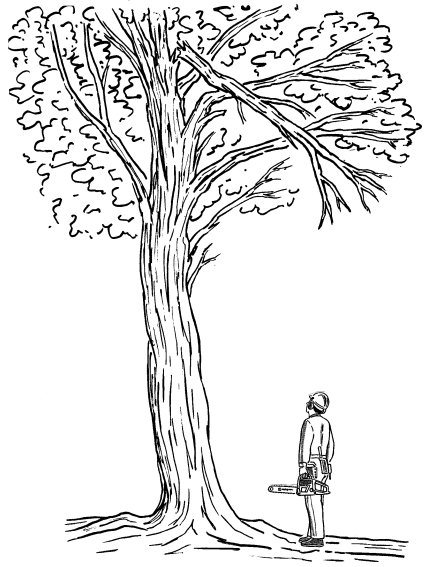
- By looking at the lean of the tree, the location of the heaviest branches and the general crown weight, you'll be able to select the direction of fall.
- Wind can affect the fall direction and must be considered along with the other points. Don't fell trees in high winds or poor weather.
- If wedges or other felling aids will be required, have them ready.

☛ HAZARD WARNING

Check For Overhead Hazards

Material falling into the work area is one of the most common causes of accidents when felling trees. Because of the height from which the material falls, severe or fatal injuries can result. Old trees and shelterbelt trees are those most likely to have material lodged in the crown. Dead branches, broken tops and cones are common.

Make sure you thoroughly check the tree to be felled and prepare your escape route as described later. Watch for falling material even after the tree has hit the ground.

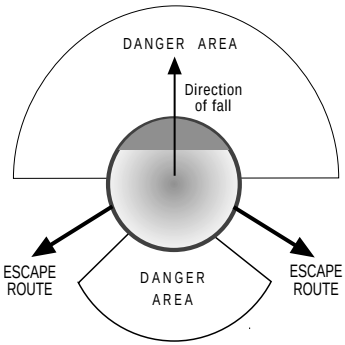


Check for hazards overhead before felling.

Preparing The Felling Site

HAVING assessed the work area and tree to be felled, you now have to prepare the site for felling.

- If there are any low branches that may get in the way as you make the felling cuts, cut them off.
- Be careful not to use the tip of the guide bar while clearing around the tree. Work in an anticlockwise direction, keeping the tree between yourself and the saw guide bar where possible.
- Clear an adequate work area around the base of the tree and provide an escape route diagonally to the rear, as illustrated below.



Have an escape route prepared.

- Look forward in the direction of fall and identify any hazards such as stumps, logs, or ground undulations that may cause the fallen tree to kick backwards or sideways on contact.
- If you have identified hazards such as material that may fall into the work area, your companion should take up a position where they can clearly see the hazard and can signal to you if there is danger as you make the felling cuts.

You are now ready to start the first of the felling cuts.

Basic Felling Techniques

THERE are three essential parts you need to consider when felling any tree over 200 mm in diameter.

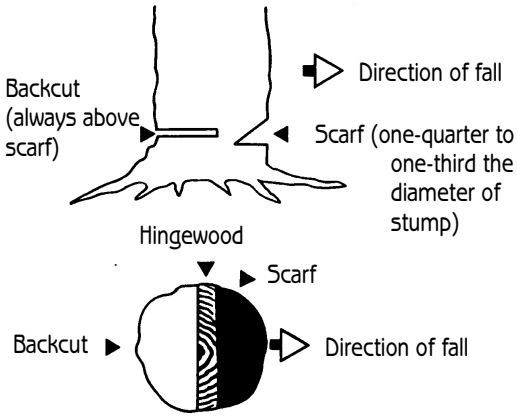
They are the:

— scarf;

— backcut, and

— hingewood.

Let's look at these in turn.



Scarf, backcut and hingewood.

THE SCARF

The scarf is important because it:

— controls the direction of fall;

- allows the tree to fall freely in the chosen direction;
- minimises splitting or slabbing.

The top cut is made first at a 45° angle between one-quarter and one-third of the tree's diameter. The cut must accurately face the desired direction of fall and finish level. The bottom cut must be made level to meet the top cut and form a clean, uniform "V" right across the diameter of the tree when the cut section is removed.

HINGEWOOD

This should be equal to one-tenth of the tree's diameter and is left uncut as the backcut is brought towards the scarf. This wood:

- acts as a hinge and controls the tree's direction of fall;
- prevents the tree from twisting or breaking sideways when falling;
- prevents the tree from falling backwards if the backcut closes.

THE BACKCUT

The backcut cleans out the wood from the back side of the tree to leave the hingewood and allow the tree to fall.

The backcut is made level and always above the 'V' of the scarf. As a guide, it should be at least one-tenth the diameter of the tree above the scarf but never less than 50 mm and a maximum of 200 mm for large trees.

If you are in any doubt as to the lean of a tree, insert a holding wedge in the cut as soon as practicable and drive it home as the cut proceeds.

The backcut is taken up until there is an even amount of hinge wood about one-tenth of the tree's diameter and parallel to the scarf. The cut must never be taken up to or beyond the scarf cut as the hingewood is eliminated and there is no control over direction of fall.

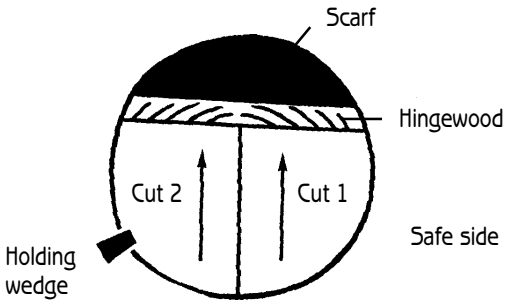
Once the backcut has been taken up and the tree begins to fall:

- Remove saw from the cut and switch off.
- Move into the planned escape route.
- Watch for falling material.
- Watch for the tree kicking back or bouncing as it hits the ground.

Felling Large Trees

WHERE a tree is too large to use only one cut for the backcut, the following method can be used. It is commonly known as "quarter cutting".

- Assess the lean and weight of the tree and cut the scarf in the normal manner.
- Either draw your plan of work on paper or mark the felling cuts with a paint bomb so that you can work with confidence.



Felling a large tree.

- Select the side of the tree on which the first part of the backcut will be made. If the tree has a slight lean, or if there is rot or something in the head that could dislodge as the tree falls, make the first part of the backcut from that side.

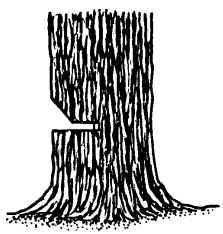
- Take the first backcut up to the hingewood. Place and tap home a holding wedge in the cut.
- Saw the second part of the backcut up to the hingewood, using the top of the bar.

This method of felling helps to maintain the hingewood across the full width of the stump.

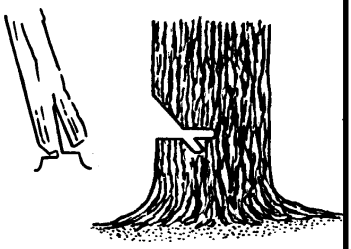
Always finish the second cut from the safe side.

☞ HAZARD WARNING

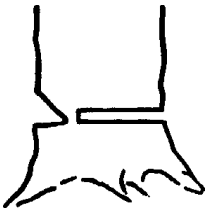
Some Dangerous Practices



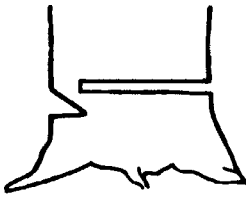
Bottom cut of scarf has been made too deep, leaving no holding wood. Tree will fall without control and may "barber chair".



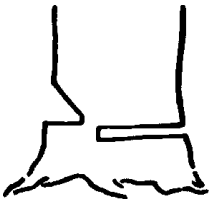
Cut has been allowed to carry on leaving no holding wood or hinge. Tree will fall without control.



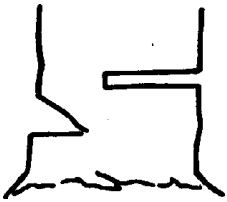
Backcut at same level as scarf may result in tree kicking back off the stump.



Backcut overcut may result in wrong fall direction and bar damage.



Backcut below scarf increases possibility of tree sitting back.



Backcut made too far above scarf.

Additional Techniques

TREES with a small sideways lean, or a slight lean away from the desired direction of fall, can be felled where desired by using the techniques outlined below.

Remember, if the tree has a large sideways lean or is leaning heavily backwards, these techniques will not be successful and may even prove dangerous. Get an experienced person or professional to handle this type of tree. A different method of falling may be required.

The methods explained below involve the use of driving wedges.

USING WEDGES

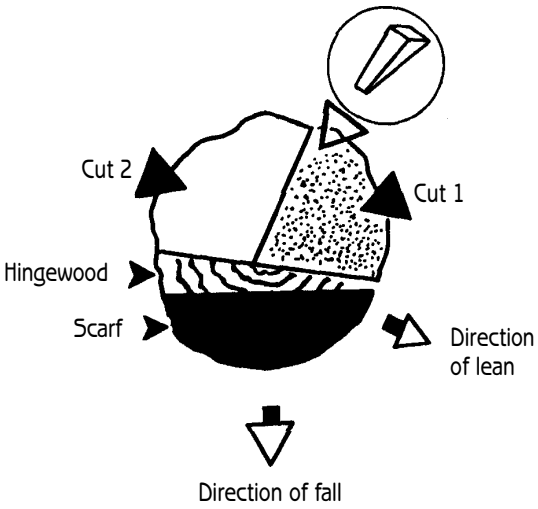
High-density plastic wedges and a mallet or suitable driving tools are required.

- Remove the bark from the wedge position so that solid wood is exposed and the wedge is immediately effective.
- Drive the wedge home as the felling cuts proceed so that maximum assistance is obtained from the wedge's leverage.
- Don't attempt to drive a plastic wedge into a closed cut as splitting or shattering of the wedge can cause facial injuries.

Let's look at methods of felling trees with side lean and those that are leaning back so that they are assisted to the desired direction of fall. Remember to have all the equipment you will require before starting any cuts.

TREES WITH SIDE LEAN

- Make the scarf facing the desired direction of fall.
- Start the backcut on the leaning side of the tree, leaving slightly narrower hinge wood than normal.
- Put the wedge in the cut.
- Continue the backcut from the other side, allowing for wider hingewood, and tap the wedge in as the cut takes place.
- Drive the wedge home when the cut is complete. The tree should fall in the desired direction.



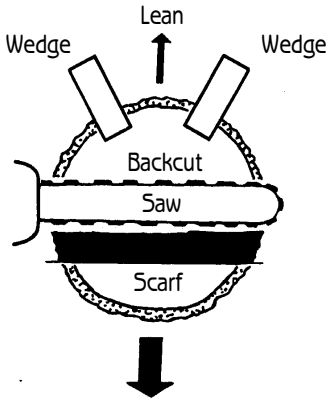
Felling against natural lean.

TREES THAT ARE LEANING BACK

There are two methods of dealing with trees that are leaning back from the desired direction of fall. Remember that wedges are limited in changing the direction of fall.

The Standard Method

- Cut the scarf as normal in the desired direction of fall.
- Backcut as normal.
- As soon as there is sufficient solid wood, insert the wedge or wedges in the cut and drive in as the cut progresses.



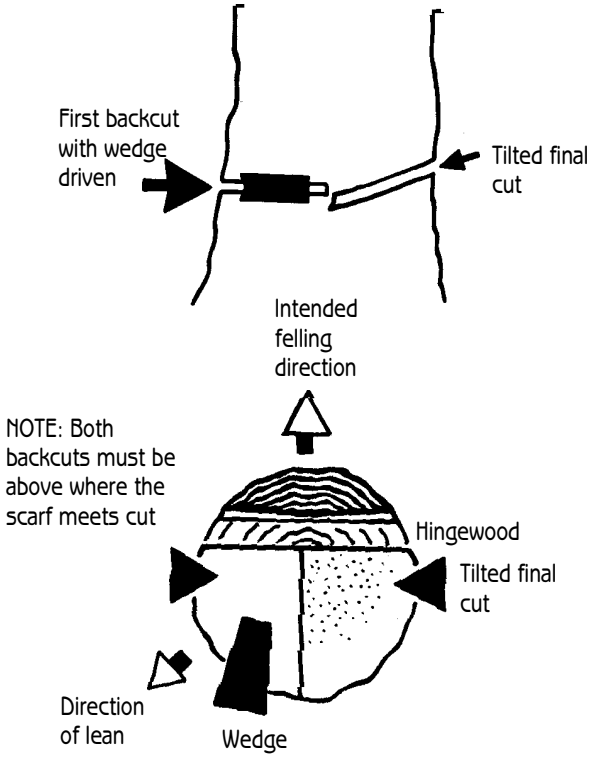
Felling a tree against the lean.

Split Level Backcuts

This method is particularly effective on smaller trees as it allows for the wedge to set when there is still a large amount of holding wood present.

- Make the scarf slightly shallower than normal (but still one-quarter of the diameter) in the normal manner.

- Make one side of the backcut in the normal manner and set the wedge in this cut opposite the scarf and in line with the desired direction of fall.
- Make the final part of the backcut tilting it down to avoid the wedge.
- Keep the wedge driven up as the final cut is made. Use another wedge if necessary.
- Make sure both backcuts are slightly overlapped but be sure they are still the correct distance (one-tenth of the diameter) above the joined scarf cuts.



Split level backcuts.

Some Felling Hazards And Difficulties

THE following tips will help you to identify and assess hazards and difficulties when felling trees.

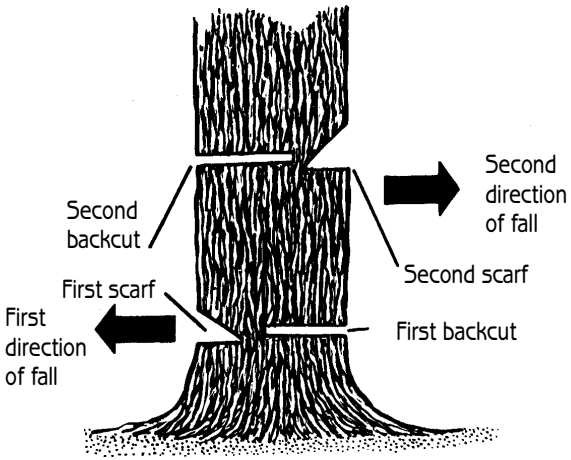
- **Felling uphill**. Be aware that the tree may slide back or kick up into the work area once it hits the ground. Move quickly along the escape route to distance yourself from the stump area. Don't turn your back — watch the path and progress of the tree you have felled.
- **Felling trees across slope.** Make sure you are not in the path of a rolling tree. Move back along your escape route away from the falling tree.
- **Spars (trees with no tops).** Make the scarf slightly deeper but not over half the diameter. Place a wedge in the backcut as soon as practicable to ensure the correct direction of fall as there is no crown to assist in tipping the tree.
- **Trees scarfed and backcut but not on the ground.**

  These are of two types, known as "cut-up" and "hung-up" trees.

CUT-UP TREE

This is where the tree sits back on the backcut. It can result from misjudged lean, failure to place a wedge in the backcut or perhaps a gust of wind.

- If a machine is present, it can assist to push the tree in the desired direction.
- Otherwise, wedges can be inserted in the backcut and driven home until the tree falls.
- If the backcut is too tight for wedges to be inserted, you can rescarf and backcut the tree in the reverse direction. Make the second lot of felling cuts the diameter of the tree above the first as this will reduce the possibility of splitting. Insert wedges before there is any chance of the tree sitting back and keep them driven home as the cut proceeds.



Method of making second lot of felling cuts.

HUNG-UP TREE

This is a felled tree that is prevented from falling to the ground by lodging in another tree.

If a machine is present, the tree should be brought to the ground.

Otherwise, use a canthook or levering device to dislodge the tree.

If these two methods fail, seek assistance. Bring in a suitable machine to assist or contact an experienced feller, who will be familiar with methods of dealing with the situation.

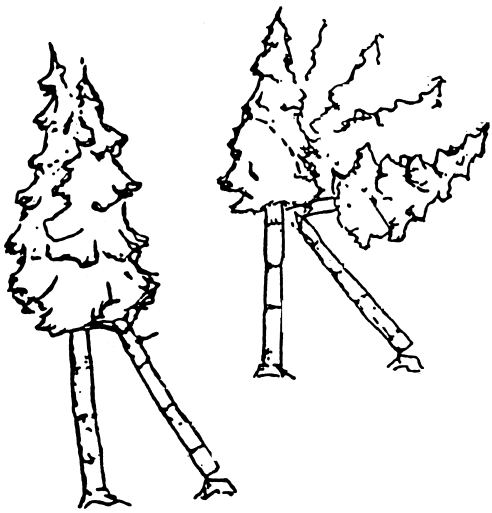
☞ HAZARD WARNING

"Hung-up" and "Cut-up" Trees

Never move forward within two tree lengths of the intended direction of fall of any "hung-up" or "cut-up" tree, or the direction of fall of a "hung-up" tree.

Where a tree is "hung up" or "cut up" tree it must be brought to the ground before you continue any other work.

Do not leave such trees unless you have marked the area while you seek assistance, or someone else is present to warn other people of the hazard. Never leave "hung up" or "cut up" trees over a lunch or smoko break or overnight without taking the above precautions.



Hung-up trees

Preparing For Crosscutting

NOW you have your tree safely on the ground, you must prepare it for crosscutting into lengths, whether for fencing or farm material, saw or pulp logs, firewood or simply for disposal.

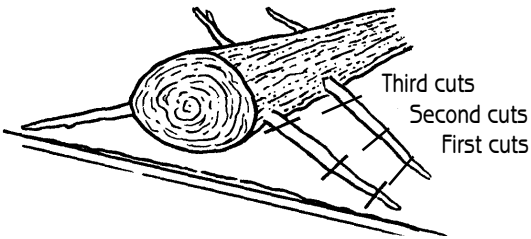
Before any work is done on the felled tree, examine it to see if any hazards exist.

- If there are any trees that were adjacent to the felled trees, give them a quick check — there may be broken branches or suspended material that could fall into the work area.
- Make sure the tree is stable and will not roll or move when you start to work on it. Place chocks if you think movement is possible — especially on slopes.
- Always finish the cut from the uphill side of the log.
- If you have the equipment, trees lying in difficult or dangerous positions should be pulled into a safe and stable position before trimming or crosscutting is started.

Tips For Safe Trimming

TRIMMING should be carried out while walking alongside the tree, provided the tree is stable and debris or scrub are not a hindrance.

- If trimming has to be done from the top of the log, the distance to the ground should be no greater than 1.5 metres. This method of trimming can cause back strain and result in falls and trips.
- Trees that are actually on the ground can be trimmed with relative safety. Beware of a tree suspended by its branches as one large branch may hold the tree up. Cutting this branch can result in the tree rolling on top of you.
- When a tree is held up off the ground, trim the large branches from the outside in by making a couple of cuts to test the stability.



Trimming a tree held off the ground.

- Always work on the uphill side of a tree on a slope.
- Use enough bar when trimming to lessen the chance of nose or bar contact and the resulting kickback.
- Watch for limbs that are under tension. These can spring back and inflict severe injury. Stand on the side away from the tension and release the tension with two cuts — first on your side and then on the other side.

Techniques For Crosscutting

WITH your tree trimmed and stable, you are now ready to start crosscutting it into desired lengths. Make sure you have your wedges and driving tool with you.

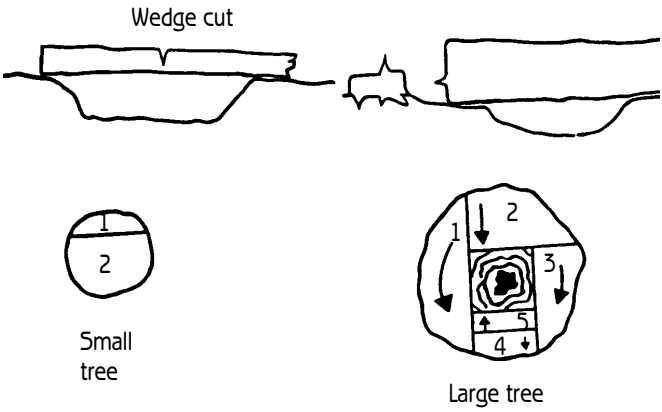
- Examine the tree and determine if any portion is liable to roll, drop or swing when the cut is completed.
- Don't crosscut logs that are suspended more than 1.5 metres above the ground. Crosscutting above this height means the saw is being used above shoulder level. Log control can also be lost as logs twist or roll.
- If it's not obvious what is holding a tree on a slope, you should assume that it may move at any time. Work out of the danger area. Make sure others are not endangered if the cut log rolls down the slope.
- Never attempt to crosscut a tree or log that is in a dangerous condition or if the cut cannot be completed. It may be possible to make a cut in a less desirable position that could eliminate the danger.
- When about to crosscut, get a firm footing and avoid standing

on any loose material. Clear a sufficient area to operate in and a path to escape if danger occurs.

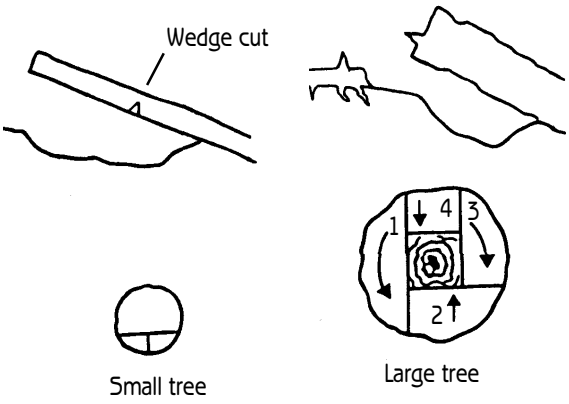
- Look for any defects such as rot or large branches that may affect your crosscutting.
- Make sure the carry-through of the saw does not bring the chain into contact with the ground or objects that may damage it.
- Mostly the tree will not be lying in an ideal position for crosscutting and the following points will assist you to have trouble-free crosscutting. The most common situations are tension, compression and end pressure.

TENSION AND COMPRESSION

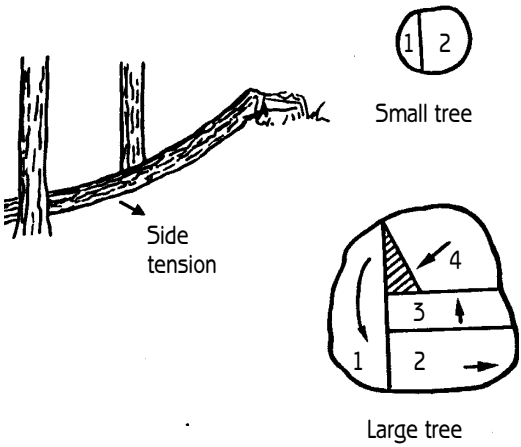
This can occur as top, bottom or side tension and compression. Follow the cutting sequences outlined below for trouble-free crosscutting.



Crosscutting a log under suspension (top compression and bottom tension).



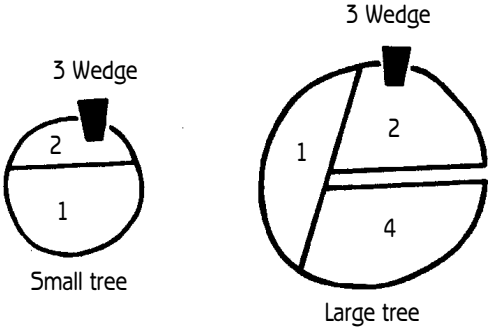
Crosscutting an overhung log (top tension and bottom compression).



Crosscutting a tree with side tension.

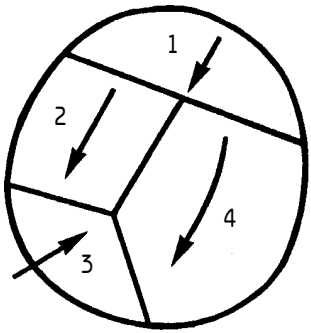
END PRESSURE

A tree on a slope can create difficulties when it is directly up-slope as its weight tends to close the saw cut.



Cutting a tree when end pressure exists.

CROSSCUTTING A LARGE TREE

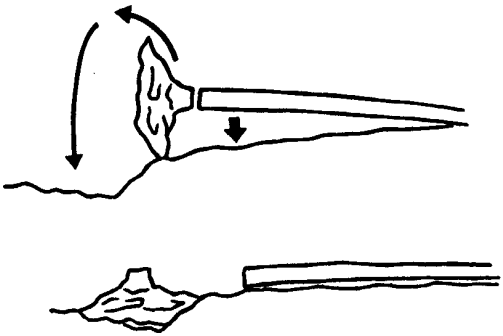


Crosscutting a large tree.
Shift sides to make cut no. 3.
Return to original side for cut no. 4.

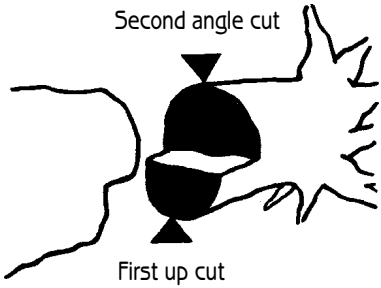
☞ HAZARD WARNING

Windthrow Trees with Rootplates

Windthrown trees that have the rootplate or rootwad still attached require special treatment. When crosscut, the rootplate can spring back to its original position and the log can move sideways towards the crosscutter.



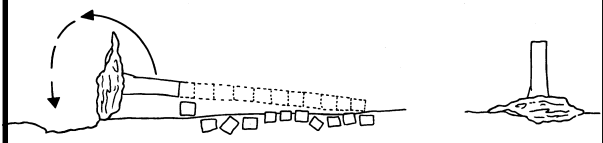
Rootplate sitting back as tree is crosscut.



Butting off a tree that may spring upwards and sideways.

☛ HAZARD WARNING cont.

A similar situation can occur as sections are cut off the tree until the rootplate counterbalances the tree and springs back into its original position.



Change of balance as sections are cut off.

- Never allow people to stand where they would be in danger of a rootplate springing back.
- Never stand on and cut trees that have the rootplate still attached.

SECTION TWO:

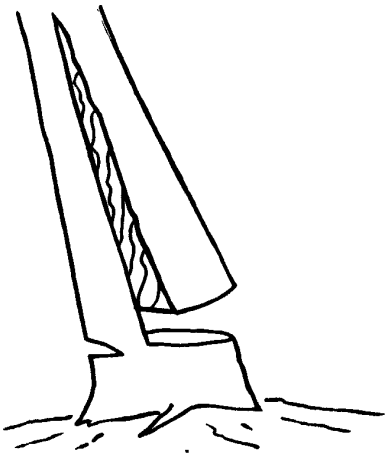
ADVANCED TECHNIQUES FOR EXPERIENCED PEOPLE

Felling Heavy Leaners

TREES with a heavy lean develop enormous tension on the upper side away from the lean. Using conventional felling with a scarf and backcut can result in the tree splitting just after you start the backcut or as the backcut advances.

The tree's splitting will form a "barber chair". You lose control and there's a risk of the tree sliding back into the work area.

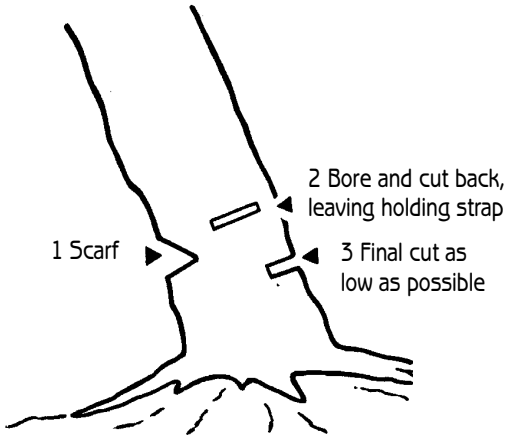
Tawa and willow are two species that are notoriously liable to splitting.



Tree splitting to form "barber chair".

To overcome splitting, you can follow these steps:

- Place the scarf in the normal manner.
- Make a bore cut, leaving a holding strap.
- Make the back final cut as low as possible.



Method of overcoming splitting.

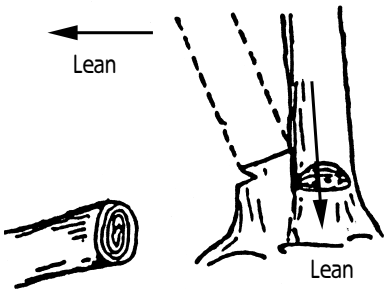
- The amount of forward lean dictates the distance between the backcuts. The greater the lean, the greater the distance.

Trees with More Than One Leader On Trunk

WHEN a tree has divided and grown in different directions, whenever possible each leader should be fallen separately in the direction of its lean.

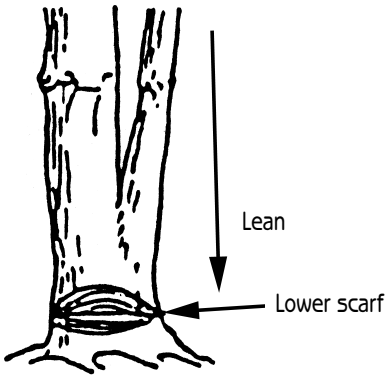
If the dividing point of the leaders is close enough to the ground to be reached safely:

- Put a normal scarf in the first leader, facing the direction of the lean.
- Bore in behind the scarf at the correct height, leaving the correct width of hingewood, and cut towards the dividing point of the leaders.
- When the first leader is safely on the ground, the remaining one can be fallen normally.
- Cut the stump off at ground level.



If the dividing point of the leaders is too high to be reached safely and the two leaders are reasonably vertical they may be fallen as one if the join does not come close to the stump area. In this instance:

- Put in a scarf deep enough and wide enough to cover both leaders. It must be made in solid wood without a join or faultline running through it.
- From the safest position, make the backcut cutting evenly towards the hingewood.
- If necessary, use wedges to ensure that both leaders start falling together.



Remember: Always fully assess difficult trees before making any felling cuts and use the safest method possible.

Winches And Wire Ropes

CERTAIN standards must be maintained if trees are going to be back pulled by winches and wire ropes. Make sure your equipment is checked on a regular basis and is adequate for the job in hand.

Here are some guidelines and advice:

WIRE ROPES

- Ropes must be of sufficient safe working load (SWL) to handle the job in hand.
- Do not use knots in any wire rope.
- Wire rope that is corroded, has signs of kinking or stranded wires or has been burnt should not be used.
- Eye-to-eye splices should not be used in any pulling rope. Joining with splices considerably reduces the rope's safe working load.

EQUIPMENT

- Check that the blocks, shackles, clamps, winches or any other equipment to be used is in first-class order — your life could depend on it.

- Only use "D" shackles with secure pins. Do not use open-sided "C" hooks.
- Equipment used should have been tested and marked with the safe working load (SWL).
- As a guide, any equipment used should be 1.5 times the SWL of the pulling rope.

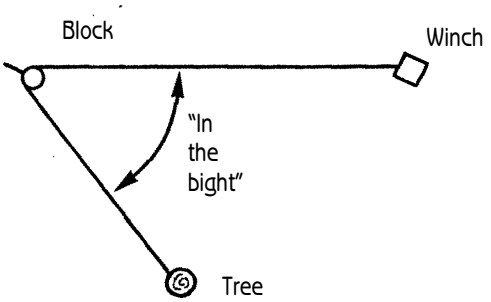
WINCHING

- Before any work begins, discuss fully with your colleagues what you intend to do. Winch and machinery operators must know what is required in relation to line tension and pulling speeds.
- Work out your visual and vocal communication before you start the work.
- Use sound stumps of sufficient size for the job in hand.
- Strops used on stumps should be 1.5 times the SWL of the pulling rope and should be notched in so they do not come off.
- Machines used must have sufficient weight and winching power to control the tree to be felled. They should be equipped with a canopy that will protect the operator from roll over or falling objects.

Back Pulling

BACK pulling is the term used when pulling trees away from their natural lean. It is done to avoid trees damaging property or falling into an area in which they will be difficult to process, such as into a gully or over a bank.

- Make sure all the equipment you need is on site.
- Secure the rope as high as practicable on the tree. The higher the rope, the easier it will be to control the direction of the tree's fall.
- Do not allow inexperienced people to do the felling, or to operate machines or winches.
- Carefully read and follow the advice in the preceding "Winches and Wire Ropes" section.
- Follow the felling techniques outlined in Section One of this booklet. Do not take shortcuts or deviate from established felling methods.
- Never allow people to work or stand "in the bight" of an operating rope.

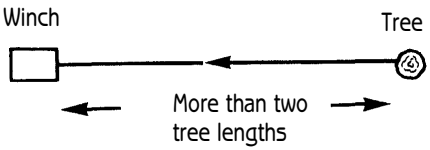


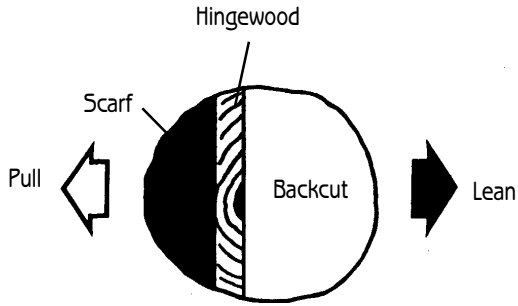
"In the bight" of an operating rope.

- Never allow machinery or people within two lengths of the trees being felled in case there's a mishap and the trees fall in other than the planned direction.

METHODS FOR DIFFERENT SITUATIONS

Let's look at methods suitable for different situations. The most common is a direct pull with the winch or machine further away than two tree lengths.





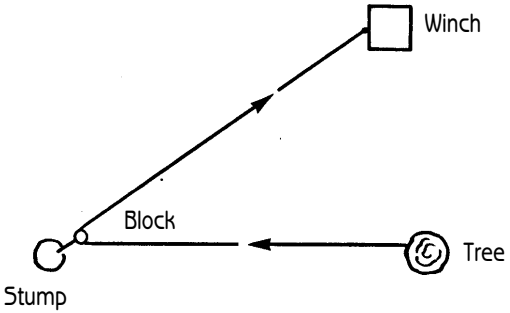
Direct pull with the winch or machine further away than two tree lengths.

- Scarf the tree in the normal manner but opposite the lean.
- Tension the rope to hold the tree in position.
- Backcut the tree in the normal manner, ensuring adequate hingewood is retained. Use wedges to hold the cut open if necessary.
- Retire to a safe position and signal the pull to commence.
- Pull slowly at first, then increase speed until the felling cuts take control.

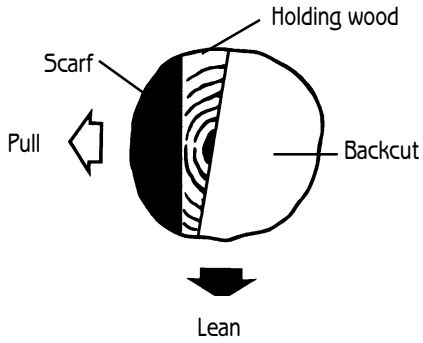
If you cannot get two tree lengths clearance to the winch, there are two safe methods which you can use in more confined spaces.

The first method relies on the use of suitably located stumps. This method positions the winching equipment and operator in a safe position and allows good vocal and visual contact.

The layout required is shown below:



Method relying on the use of suitably located stumps.

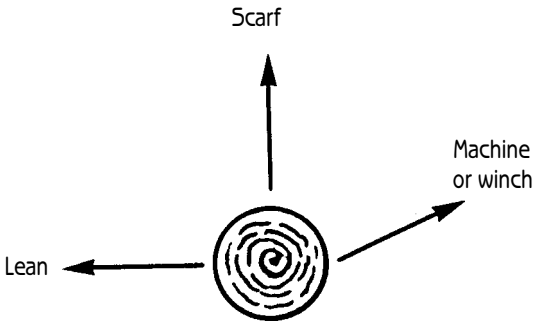


Felling procedure.

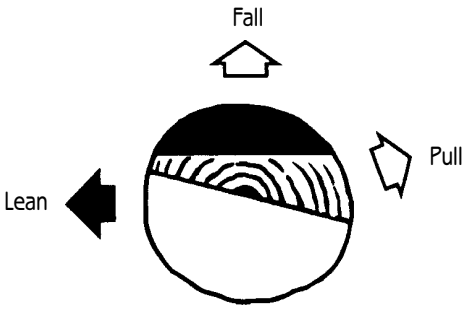
The felling procedure is:

- Scarf and start the backcut to the direction of pull in the normal manner, holding more wood away from the lean.
- Begin the pull and continue the tension as the backcut continues and until the felling cuts take control.

The second method allows you to back pull the tree in the confined space without stumps being present. The layout is illustrated below:



Method for back pulling the tree without stumps being present.



Felling procedure.

- Drive the machine out at about 80° opposite to the lean.
- Tension the rope to hold tree in position of fall.
- Scarf and backcut in the direction of the planned fall, holding more wood opposite the lean.
- The tree will free fall, swinging on the rope with no danger to the operator or equipment.

Tree Driving

THE term "driving" means pushing a tree over by felling another tree into it. Tree driving can be used in the following situations:

- To take down a tree that has only partially fallen and is either lodged against or caught in the branches of another tree.
- To drive a standing tree that has a slight back lean away from the desired direction of fall.
- To drive a tree that has sat back on the cut.
- To drive a tree into a more favourable position for processing.

Follow these steps for successful and trouble-free driving:

PREPARATION

- Ensure people are well clear of the area. Remember the two-tree length clearance applies to both the driving tree and the tree to be driven.
- The driving tree must be of sufficient size and weight to make the drive successful.

- Don't make any cuts in the driving tree at this stage.
- Choose a drive tree that has a good angle — no more than 20° off the proposed direction of fall of the tree being driven.

TREE TO BE DRIVEN

- Clear the escape route and your work area.
- Scarf the tree to be driven in the normal manner. Take up the backcut, and at the earliest opportunity insert a wedge and drive it home as the cut proceeds. Stop the backcut so that sufficient wood is held to hold control of the tree.
- If the tree to be driven is leaning and lodged in another tree, do not go under it or forward of it to see why it didn't fall to the ground.
- Be aware of any debris, dead branches or material in either the driving tree and tree to be driven. This material may be thrown back into the work area at impact.

DRIVING TREE

- Never use a dead tree as a drive tree or drive onto dead trees. On impact, pieces can fly in all directions.
- Take extra care with the scarf and backcut of the driving tree as an indirect hit may result in the tree to be driven swaying back and

falling into your work area, or pieces or branches breaking off and being thrown around.

- As the driving tree falls, remove and shut off the saw, take the escape route and watch for any dislodged or flying material.
- If you are driving a leaning or loaded tree, watch for the driving tree sliding down the leaning tree and kicking across into the work area.
- If the drive is unsuccessful and trees are hung-up, mark off the area and get a machine to finish the work.

☞ HAZARD WARNING

Tree Sitting Back on Stump

If you intend driving a tree that has sat back on the cut, or a tree that is "cut-up" (scarfed and backcut) and held by wedges, take extreme care.

A small gust of wind can cause the tree to fall into the work area. *Never turn your back on a cut-up tree.*

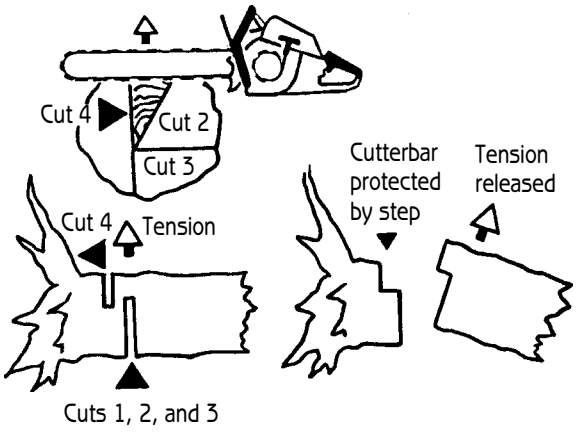
Face the cut-up tree while making your scarf and backcut in the driving tree.

Working In Windthrow

SECTION one of this booklet described how to deal with single windthrown trees. This part covers working in areas of windthrow.

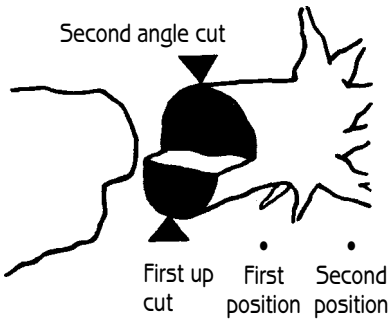
In windthrow areas, normal hazards are multiplied by the presence of broken or shattered trees and varying degrees of tension due to the trees being interlocked, bent and partially fallen.

Approach each tree with caution. Examine the tree to see which way the tension lies — whether up, down or sideways — and determine the correct method of work.



Butting a tree under tension.

- Extreme care is necessary in dealing with bent or leaning trees. If there's a machine present, it can be used to uproot the tree and reduce the hazard. Otherwise, follow the guidelines given in this booklet for dealing with this situation.
- Random lays with interlocking stems create special hazards because of bending and tensions caused by the interlocking. Carefully examine these and work out the sequence of cuts required to release the tension in a logical and safe manner.
- Watch for rootplates springing back once the counterbalance of the tree is cut off. Use the cut illustrated below. Note the shift of cutting positions.



Butting off a tree that may spring upwards and sideways.

- Always be aware of broken material that may move or be thrown around as you butt off trees or make cuts to logs under tension.

- Many branches are under tension in windblown areas. Stand on the correct side, release the tension and then complete the cut.
- When felling trees without tops, increase the scarf distance and insert a wedge as soon as possible to help guide the felling direction.