Chainsaw operation

Beginner to Advanced

4th Edition

Aligned to the national FWP and AHC chainsaw and pole saw units – current in 2024

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Beginner to Advanced

4th Edition

The material in this booklet is aligned to the following competencies from the FWP and AHC Training Packages. For a summary of the assessment requirements, see *Chapter 15: Competency assessments*.

- ***AHCMOM213: Operate and maintain chainsaws***
- ***AHCPCM205: Fell small trees***

- ***FWPCOT2259: Cut materials with a hand-held chainsaw***
- ***FWPCOT2254: Maintain chainsaws***
- ***FWPCOT2273: Trim and cut felled trees***
- ***FWPCOT3301: Trim trees using a pole saw***

- ***FWPCOT2275: Fell trees manually (basic)***
- ***FWPCOT3350: Fell trees manually (intermediate)***
- ***FWPCOT3351: Fell trees manually (advanced)***

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All line drawings were produced by Kath Ware. Most of the drawings are based on graphics provided by Husqvarna for the related interactive e-learning resource: *Chainsaw operation – Beginner to advanced.*

Source material

This booklet is based on material contained in the interactive e-learning resource developed by Workspace Training called *Chainsaw operation – Beginner to advanced*. The original resource was developed 2009 with funding provided by the Commonwealth Government's Workplace English Language and Literacy (WELL) Program.

The technical information is drawn from publications made available by Husqvarna and Stihl for the above WELL project, as well as the original NSW State Forests publication *Chainsaw Operators Manual* (2001).

The e-learning resource continues to be revised as changes occur in the FWP and AHC Training Packages, and is available for purchase. For more information, or to order the resource, please go to: www.workspacetraining.com.au and follow the links.

Technical Advisory Committee

The following chainsaw experts were involved in the development and review of this booklet:

Ben Sparks – Training Manager, Power Safety Training (PST)

Ray Stone – Principal, Chainsaw Accreditation and Safety Training

Goetz Graf – Director, Tree Management Australia

All three experts were members of the original technical advisory committee involved in the development of the interactive e-learning resource.

Disclaimer

Chainsaw use is an inherently dangerous activity. This booklet is designed to provide background information for participants undertaking a face-to-face course in chainsaw operation with a qualified trainer.

It is not designed to be used as a substitute for face-to-face training.

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In all cases, chainsaw operators, trainers and other parties using this resource should follow the directions provided by the manufacturer of their equipment, and seek further advice from the manufacturer and/or their employer if they believe there are any discrepancies between the different sources of information.

Improvements and updates

We welcome all feedback from users of the *Chainsaw Operation* booklets. If you have any suggestions for improvements or have noticed errors that need correcting, please contact David McElvenny at: david@workspacetraining.com.au.

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1. Introduction

There are two booklets in the *Chainsaw Operation* series:

- ***Maintenance, Crosscutting and Pruning***
- ***Beginner to Advanced***

This booklet – *Beginner to advanced* – includes all of the material contained in *Maintenance, Crosscutting and Pruning*, plus a coverage of the skills involved in falling trees at the basic, intermediate and advanced levels.

It is not designed to take the place of face-to-face instruction with a qualified trainer. But it will help you to learn the fundamental information that every chainsaw operator needs to know in order to work efficiently and safely.

Its purpose is to prepare you for the practical training sessions, so that you'll have an understanding of why you're being taught to do things in a certain way and why you need to wear and carry particular items of safety equipment.

The material in this booklet is aligned to the following competencies:

- *AHCMOM213: Operate and maintain chainsaws*
- *AHCPCM205: Fell small trees*
- *FWPCOT2259: Cut materials with a hand-held chainsaw*
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8. Tree defects and growth characteristics

Trees are plants that have **woody fibres** in their structure.

However, the strength of the wood tissue and overall health and shape of the tree depend on many things – including its:

- age
- genetic makeup
- events that occur throughout its lifetime.

Trees have to withstand all of the challenges that come their way, wherever they are growing.

This is because they can't move elsewhere to find greener pastures or escape if they come under attack.

So the defects and features that develop over time are a direct result of the trees' attempts to protect themselves and endure the hard times.

Set out on the following pages are the some of the defects and growth characteristics you need to look out for when you're working around trees and pruning or cutting them with a chainsaw.

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Dead, dying and over-mature trees

Trees that have lived beyond about 80% of their expected lifespan are considered to be **over-mature** or **senescent** (meaning ‘old’).

Once they reach this stage they’re less able to defend themselves against attack from insects and fungal decay.

This means they’re more likely to fail structurally when put under stress and drop branches without warning.

The **life expectancy** of an individual tree depends on several factors – in particular its species and the environmental conditions it is growing under.

Longer-lived trees include eucalypts and pines, which can live for hundreds of years under the right conditions. Shorter-lived trees include tea-trees and wattles, which may last for 20 to 30 years.

As trees progressively decline, die and decompose, they perform several important roles in the ecosystem, including:

- **nesting and breeding sites** for native insects, birds and other animals
- **food sources and hunting grounds** for animals, insects and plants
- **nutrients and mulch**, which are returned to the soil as they decompose.

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In state forests and other managed forest areas, old over-mature trees are often marked as **habitat trees** to indicate that they must be left alone during harvesting operations.

However, for a chainsaw operator they present many risks and generally have multiple hazards, such as extensive hollows, advanced decay, termite galleries and structural cracks.

Hangers

Hanging branches, or hangers, are branches that have broken off but are still suspended in the crown.

They can occur in living or dead trees and remain lodged in position until they're disturbed – such as through movement in the crown or failure of the supporting branch.

Forest workers sometimes call these branches **widow makers**, because over the years they have killed many unsuspecting workers who were standing underneath at the wrong time.

Hangers are a particular problem during tree falling operations, since the tree being felled can sometimes leave broken branches in the crowns of nearby trees.

Stags

Dead trees, also called stags, are always unpredictable and may fail at any time, especially in a windstorm or other event that puts them under stress.

The point of failure can be anywhere in the tree, which means they could drop limbs, snap off in the crown or fall over at ground level.

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Mistletoe

Mistletoe is a common name for a range of **parasitic plants** that attach themselves to host trees and feed off their sap stream.

The seeds are generally spread by mistletoe birds and some species of honeyeaters. Trees are most susceptible to attack when they're already in decline.

As the mistletoe develops and produces new foliage, it progressively takes up more of the host's food supply and eventually kills the branches it is growing on. In some cases, trees can recover by dropping the affected branches. However, in severe cases, the mistletoe ultimately kills the whole tree.

Burnt trees

Burnt trees pose special risks to tree workers, especially after an intense wildfire.

Fires don't just burn trees from the ground up. They can extend well into the **root systems** and burn out hollows and pockets underground that may collapse later. These hollows can cave in under the weight of a vehicle, or in some cases, even a person walking on top.

Although burnt root systems can be very difficult to see directly, signs of possible hollows include unusual depressions or soil movement near the base of the tree.

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Chimneyed trees

When trees with hollow trunks catch fire, they can develop a **chimneying action** under certain conditions.

As the tree burns on the inside, the smoke flows up the pipe and exits through holes in upper branches or trunk.

This sets up a convection current inside the tree which draws in air at the bottom and supplies extra oxygen to the flames.

Chimneying trees burn with great intensity and will eventually fall over once enough wood fibre has been consumed.

Even if they remain standing, they can still be extremely unpredictable and prone to collapsing at any time without warning.

All burnt trees

The same caution applies to any standing tree that has survived a fire – it could still be carrying serious hazards such as dead wood, hanging branches and structurally unstable crowns.

Always look up before walking under the crown of a damaged tree, particularly when the branches are touching or entangled with neighbouring trees.

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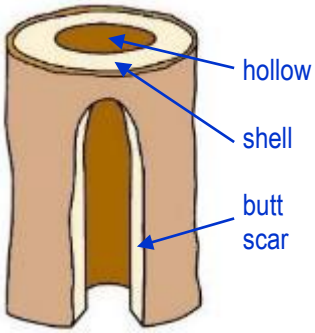
Fungal decay

Wood decay fungi are a broad group of fungus species that rely on wood fibres as their food source.

Decay fungi can cause significant internal damage to a tree without making it too obvious from the outside.

The photo at right shows decay in a felled tree that has completely destroyed the heartwood, and yet has left the outer shell virtually untouched.



Since this doesn't necessarily affect the tree's ability to transport moisture and food through the sapwood and inner bark, it can result in a tree that looks reasonably healthy but is structurally very unsound.

The amount of internal decay that a tree can tolerate without failing structurally will vary according to the species of tree and also the thickness of the shell.

If the shell of sound wood fibres is too thin, it will be more likely to fracture under stress. The shell thickness needed to support the tree will also depend on whether there are openings or other defects in the stem, such as a **butt scar** – as shown in the diagram above.

One of the most obvious signs of extensive internal decay is the presence of **fruiting bodies** on the outside of a trunk or branch (see photo at right).

These fruiting bodies are often called **conks** or **brackets**, and they release fungal spores into the air as part of the reproduction process.

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Insect attack

The two main categories of insects that attack trees are borers and termites. Like decay fungi, some insects are capable of causing extensive internal damage without it being obvious from the outside.

Borers

Most borers are **beetles** that do their wood boring in the grub stage of their life cycle. The female beetle lays its eggs on or under the bark. When the grubs hatch they tunnel into the wood tissue. The grubs then pupate and emerge as beetles.

The photo at right shows **longicorn borer** tracks and holes.

Borers are more likely to attack dead, dying or injured trees, since cracks or wounds provide easy access. Apart from the direct damage they do to the wood tissue, borers can also introduce **infections** into the tree and provide openings for **fungal spores** to enter.

Termites

Termites are sometimes called ‘white ants’ because many species have a whitish colour – but in biological terms they are actually more related to cockroaches.

It’s common for some species of termites to eat out a **pipe** through the middle of the trunk and into the branches.

From the outside of a tree, termite activity can be difficult to detect. However, there is sometimes evidence of galleries and mud runways under the bark, as shown in the photo at right.

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Poor branch attachment

The main causes of poor branch attachment are epicormic growth and included bark.

Epicormic growth

Epicormic growth arises from **epicormic buds**, which normally lie dormant underneath the bark. When the tree is stressed or damaged, such as through insect attack, drought or bushfire, the buds respond by sending out new shoots.

Trees that are good at using this survival mechanism (such as many eucalypt species) are often referred to as **re-sprouters**.

The problem with branches that develop from epicormic shoots is that they only have a **shallow attachment** to the stem.

This tends to make them much weaker than branches that form during normal tree growth, since normal branches are embedded well inside the main stem that they're growing from.

In most cases, as epicormic branches grow larger and heavier they become more prone to failure or collapse.

Poor pruning practices can also cause epicormic growth, since the tree is basically responding to the damage it's received by pushing more nutrients to the wounded areas – which feeds the buds and triggers their growth.

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Included bark

Included bark occurs when the angle of the **fork** between the branch and stem is too narrow to allow them both to grow in girth without trapping bark in the junction.

The trapped bark acts like a **crack** in the junction, because it separates the wood fibres on either side.

As the branch and stem continue to grow, they push the union apart and make it progressively weaker.

The same problem occurs in **codominant stems** – as shown in the photo above. The union between the stems becomes progressively weaker as they grow in girth and the bark builds up between them.

In some trees with codominant stems, a **rib formation** develops on either side of the weakness to help support the stem – as shown at left.

The pointier the rib is, the larger the internal crack is likely to be.

When a weak union starts to develop **other defects** as well – such as insect attack, fungal decay or cracks in the wood fibres – its structural problems become even more serious.

In these cases, the branch or stem is much more likely to fail under stress.

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Poor architecture

Poor architecture in a tree refers to growth patterns that create a structural imbalance in its shape. It includes asymmetrical (lopsided) crowns and trees that grow on a lean.

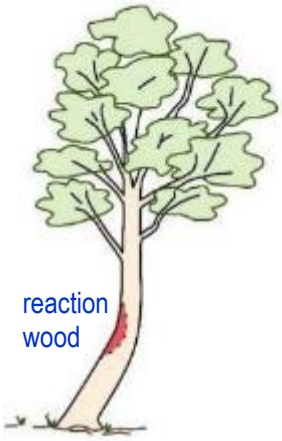
Trees with poor architecture are more prone to failure when they develop additional problems, such as fungal decay, termite attack, cracks in the stem or root disturbances.

Leaning trees

Leaning trees often occur at the edge of a stand of trees as they try to grow away from other trees competing for the same sunlight.

A similar situation applies when they're growing near tall buildings that cast a shadow on them. They're also found in windy areas where the wind blows continually from the same direction.

Trees that grow naturally on a lean will generally develop coping mechanisms to compensate for the lopsided centre of gravity. This includes reaction wood in the stem and roots that offset the lean.



Reaction wood is formed to counteract the additional stresses placed on the stem. In hardwoods, it occurs on the upper side of a leaning trunk, or on top of a branch, as it tries to pull the trunk or branch upwards.

In many cases, the upper parts of a leaning tree will self-correct and grow more upright. These trees are likely to remain strong and stable while they're healthy. However, if they're subjected to injuries or disturbances in the surrounding environment, they are more likely to fail than a well-balanced tree.

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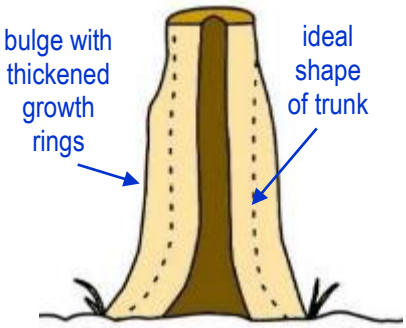
More examples of stem defects

Most defects in the stem develop from mechanical injuries, attack from organisms or abnormal growth patterns. We've already discussed various examples of these problems, but here are a few more markers of underlying structural weaknesses in the stem.

Bulges

Bulges are enlarged or swollen areas of the stem that occur around regions of **advanced fungal decay**. They develop as the tree tries to strengthen the weakened area by building thicker growth rings around it.



Note that not all species of fungi cause this response, so a tree could still suffer from extensive decay without showing a bulge around the infected area.

Butt scars

Butt scars appear as a triangular shaped gap at the base of the tree. Some people call them **fire scars**, when the initial cause was a fire which allowed access to attacking organisms.

The opening generally has a **hollow** behind it, which may extend up through the trunk as a pipe.

Trees can withstand a hollow stem and an opening at the base, as long as the shell of good wood is thick enough to provide structural support and the opening is not too wide.

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Cankers

Cankers are localised areas where the **bark** and **cambium** have died. They often result from attack by organisms or mechanical damage, such as through impact from passing vehicles, lawn mowers and so on.

Cankers stop new layers of growth from forming in that area, and it is common for internal or external fungal decay to be present.

Wounds

Wounds are injuries that expose the **sapwood**, and in serious cases may extend into the **heartwood**.

A new wound is not likely to make the tree immediately hazardous because it takes time for organisms to enter and degrade the wood fibres. However, an old wound may be associated with insect attack, fungal decay and localised hollows.

Cracks

Cracks are a **separation** of wood fibres. They can occur in the stem, branches and roots, and often result from wounds that haven't healed properly or weak branch unions that have split.

Deep cracks can be serious structural problems because they reduce the tree's ability to withstand stresses and also allow fungal decay to develop.

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Seams

Seams can look similar to cracks, in that they also are a separation of fibres that run vertically up the stem. However, they're not as serious as structural cracks because they're an active part of the **healing process**.

The seam is formed as woundwood progressively grows back on either side of the wound and meets in the middle.

Nonetheless, it's common for the original wound inside the stem to contain compartmentalised decay. This is particularly the case with seams that don't seal properly, as shown at right.

When the bark rolls in, they are called **inrolled cracks**, as described below.

Inrolled cracks

Inrolled cracks are formed when the two sides of a wound don't close up properly.

As new layers of wood and bark are produced, they roll inwards instead of allowing the wood fibres to join together. This traps the bark in the middle, keeping the two sides apart.

New growth tends to push the two sides further apart, which widens the crack and increases the weakness in the stem.

Inrolled cracks are always associated with internal **decay**.

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9. Introduction to tree falling

We've already discussed the general principles relating to chainsaw safety and environmental care in Chapter 2 of this booklet.

All of these principles apply equally to tree falling.

However, there are a few extra control measures you need to put in place when you're tree falling.

This is because there are additional risks involved – not just to yourself, but also to anyone else who is working or travelling through the area.

One of these measures is to set up warning signs at all road entry points, and anywhere else that's specified in the Harvesting Plan or Site Safety Plan.

You also need to give people a radio channel to call, so they can advise you in advance if they want to enter the area. This allows you to call them through when it is safe to enter.

The other control measures you'll need to put in place will be determined by the hazards you identify in your risk assessment. We looked at the basic hazards in Chapter 2. Below are some more details on the hazards that relate specifically to tree falling.

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Main hazards

There are three main categories of hazards you need to think about when you're assessing the risks in falling a tree – the weather, the tree's immediate surroundings and the tree itself.

Weather

Always check the current weather, and also the forecast for the day before you start work.

Watch out for high winds, extreme temperatures, heavy rain and lightning. It's not safe to fall trees under any of these conditions.

The tree's immediate surroundings

The sorts of hazards you should look for in the tree's immediate surroundings include:

- **broken limbs**, also called 'widow makers' or 'hangers', hanging in nearby branches
- **nearby hazardous trees**, such as dead or burnt-out trees
- **steep banks, rocks or other obstacles** in the line of your escape route
- **other workers or machines**
- **problems with visibility**, such as failing light or fog.

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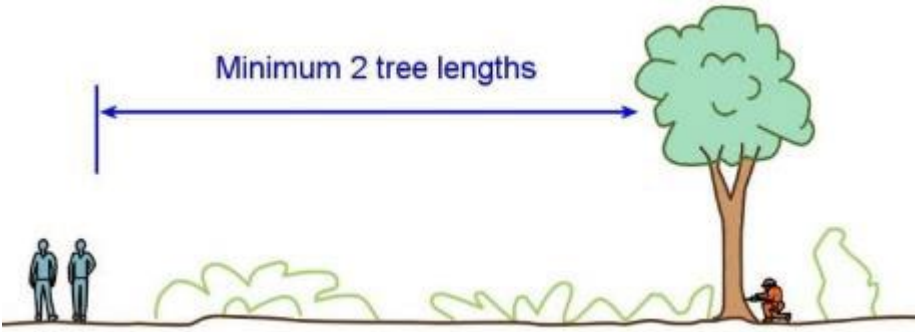
Note that other workers or machines should be at least **2 tree lengths** away from the tree you are falling.



The tree itself

The final set of hazards relate to the **tree itself**.

These will determine the way you prepare the fall, the cutting techniques you use, and in the end, your decision as to whether or not the tree is safe to fall.

Remember, when you're working, it's **your responsibility** to decide whether you've got the ability to fall a tree safely.

This will depend on:

- your level of **experience**
- the tree falling **accreditation** you hold (either basic, intermediate or advanced)
- the types of **problems** that the tree is presenting you with.

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There are going to be times when you decide that a tree is **too dangerous** for you to fall.

In these cases, you'll need to either ask an expert operator to have a look at the tree, or get a machine to take it down.

Typical hazards

Here are some typical hazards you need to look for when you're assessing the risks in the tree you're about to fall, and your capacity to fall it:

- **dead or burnt out trunks**
- **decayed or hollow trunks**
- **widow makers** hanging in the tree's crown, or branches interlocked with adjoining trees
- **an excessive natural lean**, or a lean away from the desired direction of the fall
- **hang-ups**, that is, other trees that have fallen and lodged against the tree
- **storm or snow damage**
- **exposed or unstable roots**
- **thick undergrowth** at the base that can't be cleared away
- **climbing vines** in contact with the tree.

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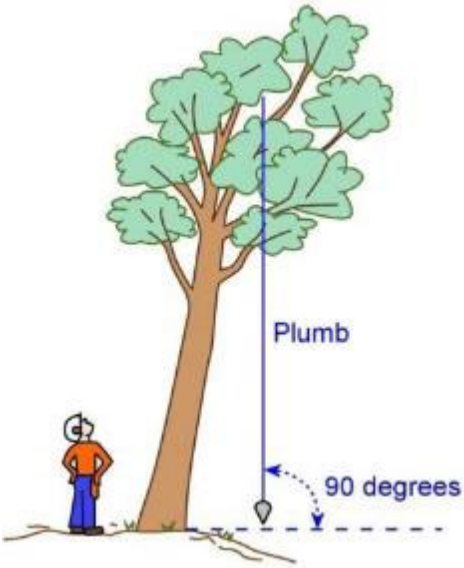
10. Preparing to fall a tree

In this chapter, we'll look in more detail at the main factors you need to consider, and the preparations you need to make, before you start the first cut on the tree you're going to fall.



The tree's natural lean

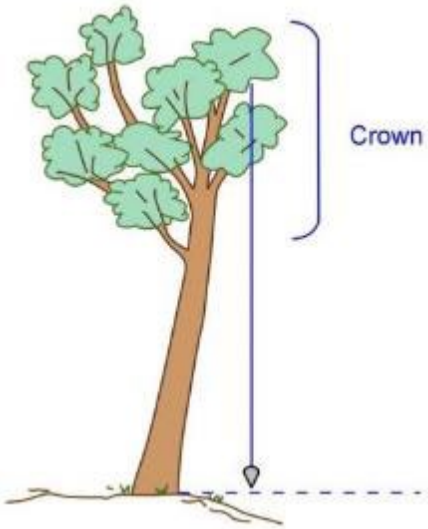
When you're thinking about which direction to fall the tree in, one of the biggest influences on your decision will be the tree's **natural lean**.

The **lean** in a tree is its deviation from plumb – or 90 degrees to a level line.

Where possible, you should fall the tree **in the direction of its natural lean**, because you'll have gravity working with you all the way.

There are times, however, when the **crown** has heavy growth or long branches on one side which may override the natural lean of the tree.

So you need to make sure that the direction you choose takes into account the **weight distribution** in the crown.



The tree above, for example, leans to the right, but its crown has a weight distribution more to the left.

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In a stand of trees, you also need to consider which tree you'll fall first. If you don't, you might end up creating a **hang-up** (below left), or **widow maker** (below right), or extra work for yourself by having the head of a tree land at the base of another tree that you're about to fall.

You also need to be careful with branches that are **inter-grown** with other trees or have vines running between them. Again, this can result in hang-ups, or limbs breaking off and falling back towards you, or other problems that stop the tree from falling cleanly in the desired direction.

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Checking for defects

Check the tree for **defects** before you start cutting. Look for:

- external scars
- cracks
- deadwood in the crown
- widow makers
- burnt sections
- insect nests or other damage.

To check for **internal decay**, 'sound' the tree with the sharp edge of your axe or make a vertical bore cut with your chainsaw.

Remember that some species are prone to defects in the heart, such as pipes (as shown at left).

Be very careful in gusty conditions, or if strong winds have been forecast. Keep in mind that the **wind velocity** is always less at ground level than up in the crown, and a gust can be strong enough to blow a tree off course if it catches the branches at a critical moment.

Never work within the **drop zone** of a widow maker, or hanging limb.

The same applies to **hang-ups**, or trees that have lodged against another tree. Never try to fall a tree if it has a hang-up resting against it, or try to knock down the hang-up with another tree.

You should mark it with a sign or hazard tape, and take steps to have a machine pull it down.

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Deciding on the direction of fall

In addition to the direction of the tree's natural lean, there are other factors that need to be considered when you determine which direction to fall the tree in.

Try to fall into an open space, and remove the trees systematically to create your own space for a clear line of fall.

Also avoid falling a tree into stumps, rocks, logs or other trees, wherever you can.

Preparing the tree

Once you've carried out your assessment of the tree and surroundings, and decided on the direction of the fall, you're then able to start preparing the tree and escape routes.

The first step is to **clean around the base** for at least a metre, to give yourself room to work.

You also need to remove any saplings along the falling line that might throw material back towards you when the tree hits them.

Any limbs or logs that are in front of the tree and extend back towards your escape routes should also be removed or cut through, so they don't flick up if the tree lands on them.

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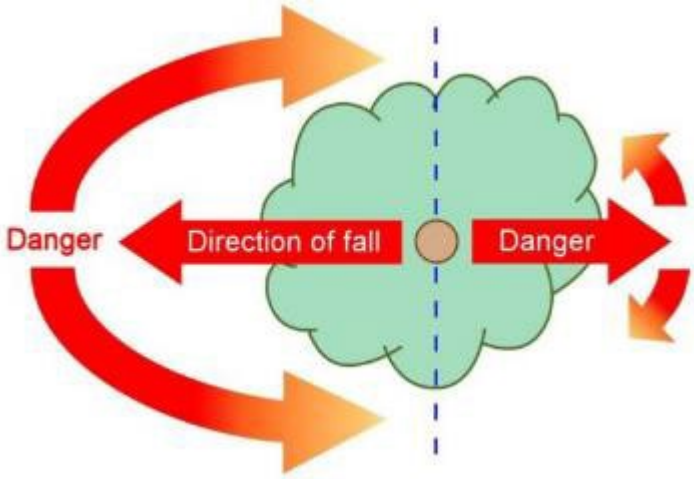
Escape routes

Below is a bird's eye view of a tree about to be felled, looking down from the crown.

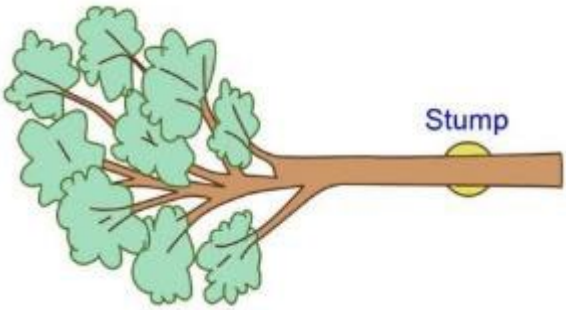


Obviously, the area of greatest danger is **in the line of fall**, but the danger zone also includes **both sides of the tree** right back to the stump itself. This is because branches may break or dislodge in the falling tree or nearby trees as they come into contact with each other during the fall.

The danger zone also extends **directly back from the stump** and to either side. This is because there are several potential hazards behind the stump that you need to allow for. For example:

1. **If the butt kicks up** as the tree falls, it will generally go straight back over the stump, or immediately to one side.

   The drawing at right shows the tree viewed from above.



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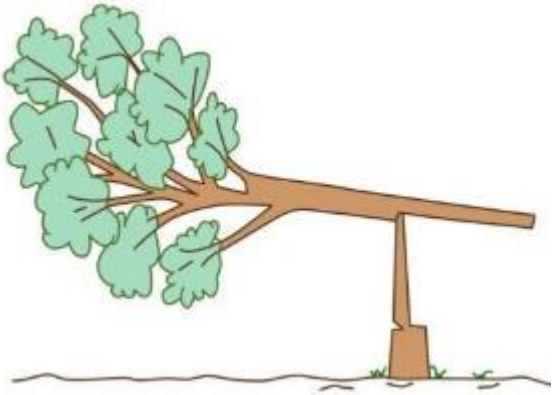
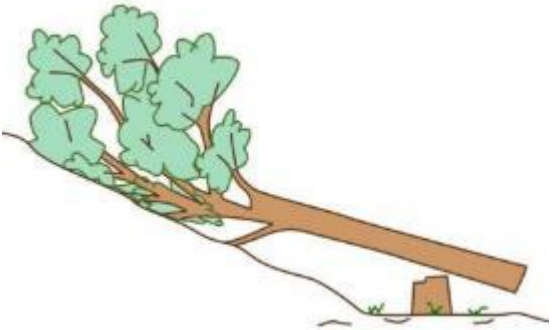
2. **If the tree splits up**, it will 'slab' backwards from the line of fall. (For more information about this 'barber's chair' hazard, see Chapter 13, under the heading 'Trees that split'.)

   The same thing could happen if the tree snaps in the falling line.



3. **If you're falling the tree uphill**, it may slide backwards, past the stump.

   Note that you should never fall a tree uphill unless you've been trained to do so – this is a very risky practice and is only for advanced tree fallers.

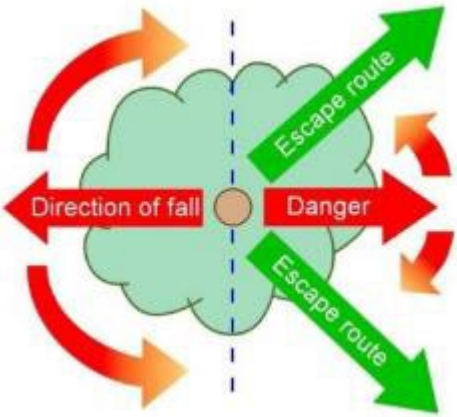


So you should prepare an **escape route** in a diagonal direction – that is, 45 degrees – from the back of the tree.

Do this by removing obstacles for at least 6 metres along the pathway.

When deciding on which side of the tree the escape route should be, try to pick a pathway that is:

- **uphill** rather than downhill
- **away from the natural lean** and weight distribution
- **away from widow makers**.



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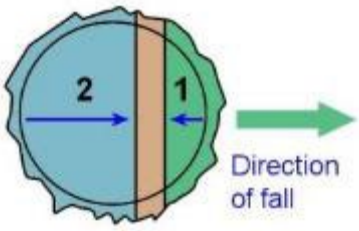
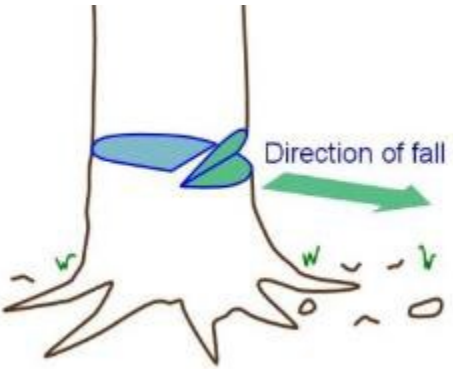
11. Scarf and back cut principles

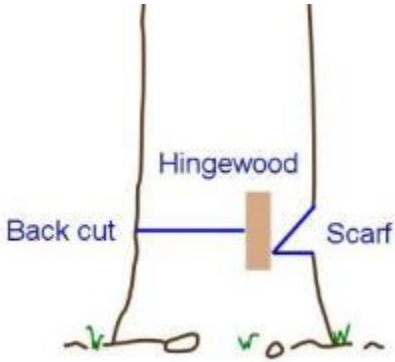
The simplest and most common way to fall a tree is to:

1. **Put a scarf cut at the front.**
2. **Put a back cut at the rear.**



The **back cut** stops short of the scarf, leaving a section of wood fibres called the **hinge wood**, because it works like a hinge as the tree falls.





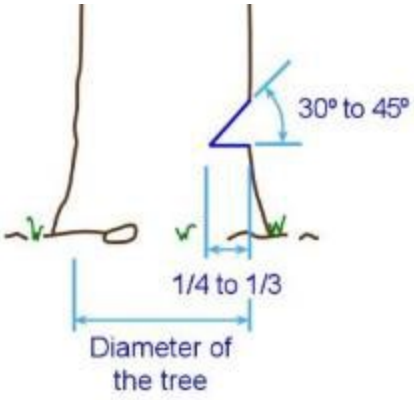
Scarf cut

The scarf cut sends the tree in the direction you want it to go in, and breaks the hinge wood at the right time to give you maximum control over the fall.

The depth and angle for a typical hardwood tree are:

Depth: 1/4 to 1/3 diameter of tree.

Angle: 30 to 45 degrees.



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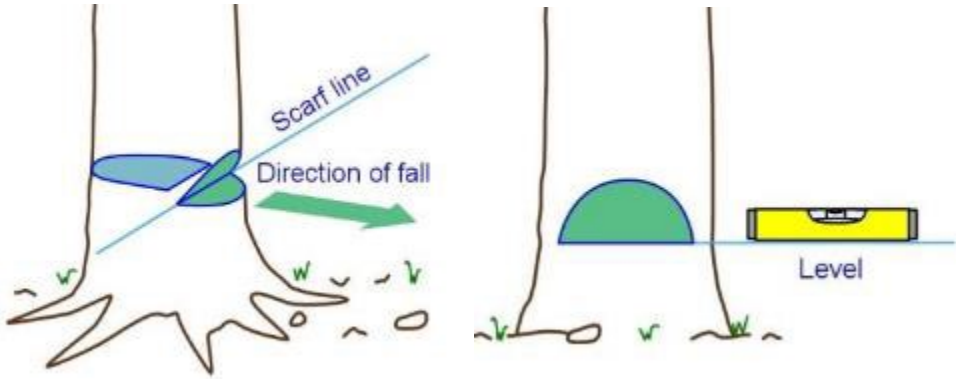
Other species may have different angles and depths that work best for them. So if you're ever unsure about the optimum scarf size for the tree you're about to fall, you should check with your trainer or another expert operator.

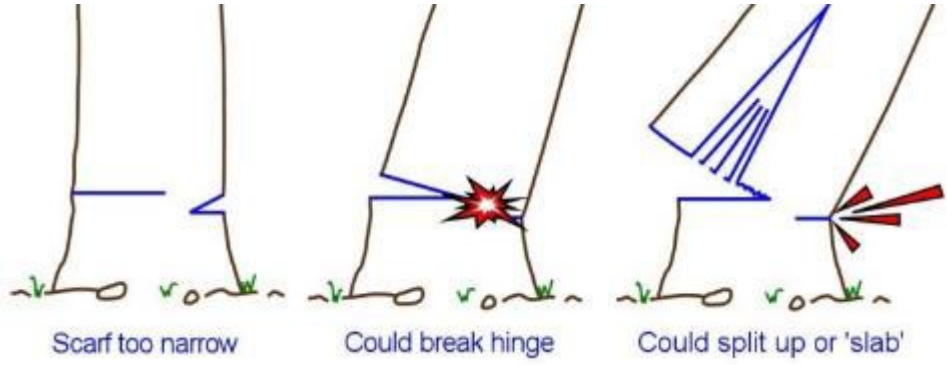
Getting the scarf right

The two cuts need to meet exactly at the **scarf line** without any overcuts or undercuts. The bottom of the scarf should also be level.



It's important to get the scarf right, because various things can go wrong if you don't. For example, if the opening is too narrow, the scarf will close too early, and break the hinge wood before the tree's fall is under control.

This is likely to affect the direction of the fall. It might also cause the tree to split up, or 'slab'.



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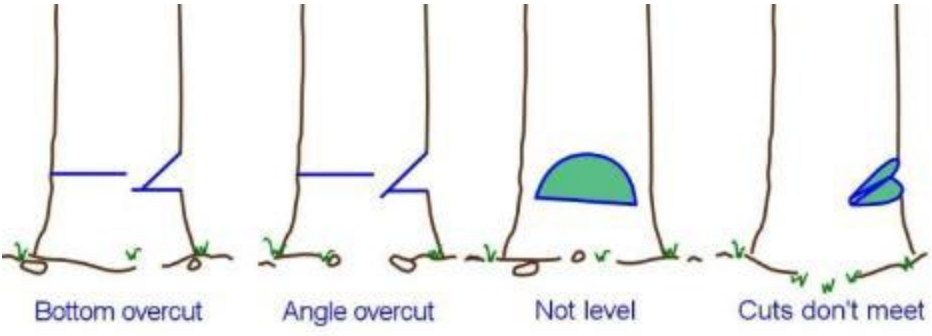
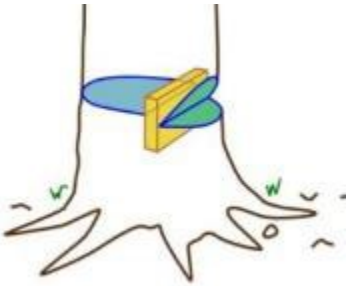
Problems can also occur if the two cuts don't meet on the scarf line because one of them is overcut, or if the scarf isn't level, or if one side doesn't match up properly, even if the other side does.



Remember, it's the **hinge wood** that controls the fall, and stops the tree from twisting or breaking sideways.



So it stands to reason that any errors in the scarf will have an effect on the shape and performance of the hinge.

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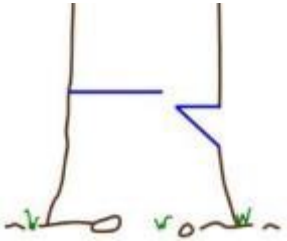
Other types of scarfs

So far we've only covered the standard scarf, which is the one you're likely to use most often. However, there are other types of scarfs that can be used in particular situations. Below are three examples.

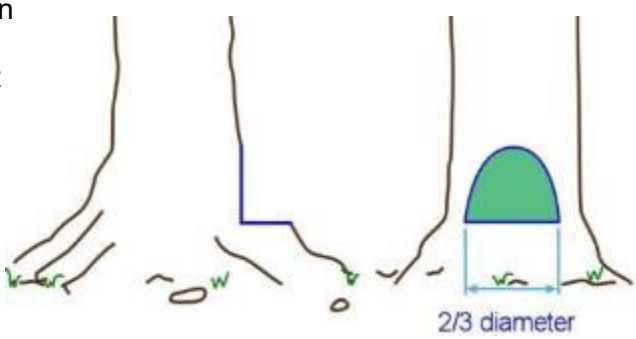
1. **Humboldt**, or **reverse scarf** – often used for cutting saw logs, because it lets you get a bit more recovery out of the log.

   It can also be used when falling a tree uphill, because it helps to ensure that the tree doesn't slip backwards over the stump.



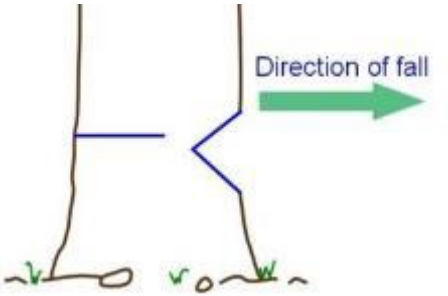
2. **90 degree scarf** – can be used on trees that have a very large butt swell.

   The depth is determined by how deep you need to go to cover 2/3 of the diameter of the trunk.



3. **V scarf** – used on large trees, particularly when the trunk diameter is more than twice the length of the guide bar.

   The wide mouth opening enables the hinge wood to control the fall of the tree through a greater arc before the two sides of the scarf meet.



   We'll look in more detail at the V scarf in Chapter 13 (More advanced techniques).

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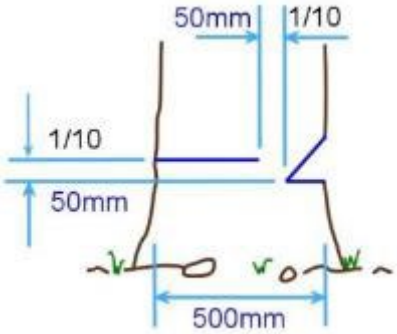
Back cut

Once the scarf cut is done, you can put the back cut in. The back cut should be level, and slightly higher than the scarf line.

The proportions and dimensions shown in the diagram at right are typical specifications for a normal tree with a diameter of 500 mm.

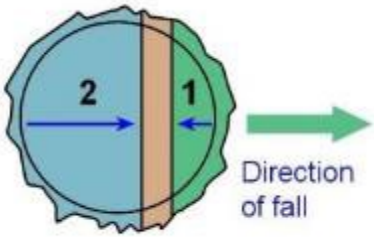


Height above scarf line

In most cases, the **height** of the back cut above the scarf line should be **1/10 of the tree's diameter**.

So on a tree that's 500 mm in diameter, the back cut's height will be 50 mm.

This step-up helps to stop the tree from slipping backwards over the stump when it's released.



Depth

In general, the depth of the back cut should allow the **width** of the hinge wood to be **1/10 of the tree's diameter**. Again, on a 500 mm tree, this will be 50 mm.

But there are times when the tree may call for the hinge to be cut on a **taper**, so you can pull the direction of the fall away from the tree's natural lean. See Chapter 13 for more details on the variations on the 1/10 rule.

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Step by step process

Now that we've discussed the principles of the scarf cut, back cut and hinge wood, it's time to look in more detail at the actual process of carrying out the cuts.

Scarf cut

Some people find it easiest to start a scarf with the **bottom cut**, so you can get it level and running exactly at right angles to the desired direction of fall.

However, other operators prefer to start with the **angle cut**, particularly under certain conditions.

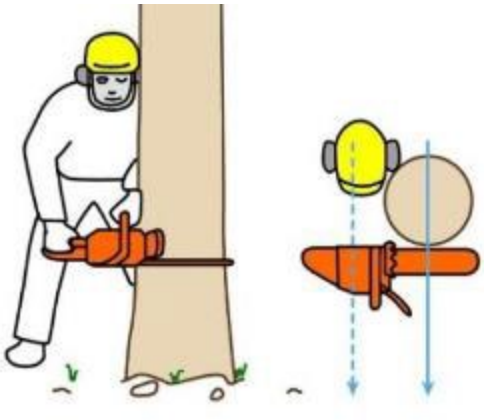
Your trainer will talk to you about the most appropriate cut to begin with for the conditions that you're working in.

If you're starting the scarf with the bottom cut:

1. **Use the gunning sights** on the saw to line up the body of the saw with a point that's exactly parallel to where you want the tree to fall.

   Hold the saw comfortably so you can position it accurately for the first cut.

   Make sure that the bar is level.



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2. **Make the bottom cut**. You can check the cut for level before you go too far, by stopping the saw in the cut and sighting it from the front.

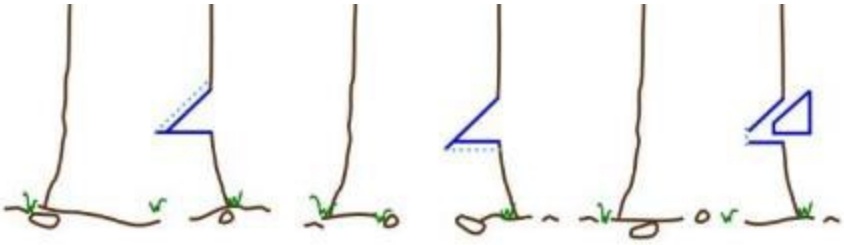
   Once you're satisfied, continue to cut to a depth of between one quarter and one third the diameter of the tree.

3. **Make the angle cut**. Take care that the angle cut matches up evenly with the bottom cut at the scarf line.

4. **Use your axe** to clean up the scarf line and to check that you haven't overcut either of the cuts.

If the cuts don't meet properly, make sure you fix them up before you move on to the back cut. For example:

- **If you overcut the bottom cut**, take a bit more off the angle cut (as shown below in the left hand drawing).
- **If you overcut the angle cut**, take a bit more off the bottom (below middle).
- **If the angle cut ends up being too high**, and the scarf would be too deep, you can split out the scarf block to leave a step at the back (below right). As long as the top and bottom cuts extend into the tree by the same amount, and the step is not too high, this is a good way of getting out of the problem.



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Cutting the back cut

To set out for the back cut, you can mark the points it should finish at with a little stick on either side, so you've got something to sight to when you line up the bar.

For example, with the tree shown at right, the inside of the cut will finish 50 mm up and 50 mm back from the scarf line, so a 50 mm wide wedge is handy for marking it out.

Make an incision with your screwdriver and push the stick in.

When you do the back cut, make sure you're in a position that will let you **finish the cut on the safest side of the tree**.

You will have already established which side is the safest side when you carried out your initial assessment of the tree and decided where the escape route would go.

Never walk across the back of the tree to get to your escape route, just in case the tree kicks backwards.

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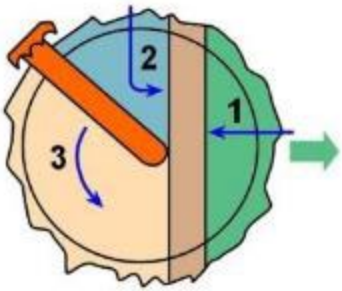
When the tree begins to fall – that is, when the fibres in the hinge wood start to snap – pull the saw out and quickly walk down your escape route.

Make sure you regularly look back to check for flying limbs, or 'hangers' that might fall from above. Stay well clear until all movement has stopped, and you're sure there are no loose branches about to fall.

Back cut on large trees



If the diameter of the tree is **more than the length of the bar**, you can use a circular motion to complete the back cut.

The steps are as follows:

1. **Cut the scarf.**
2. **Put a bore cut in** behind the hinge wood on the opposite side of the tree from your escape route. Then move the bar forward to set up the hinge wood thickness.
3. **Rotate the saw around the back** of the tree to finish the back cut, using the nose as a pivot point.

If you need to use wedges, put them in after completing about 2/3 of the back cut.

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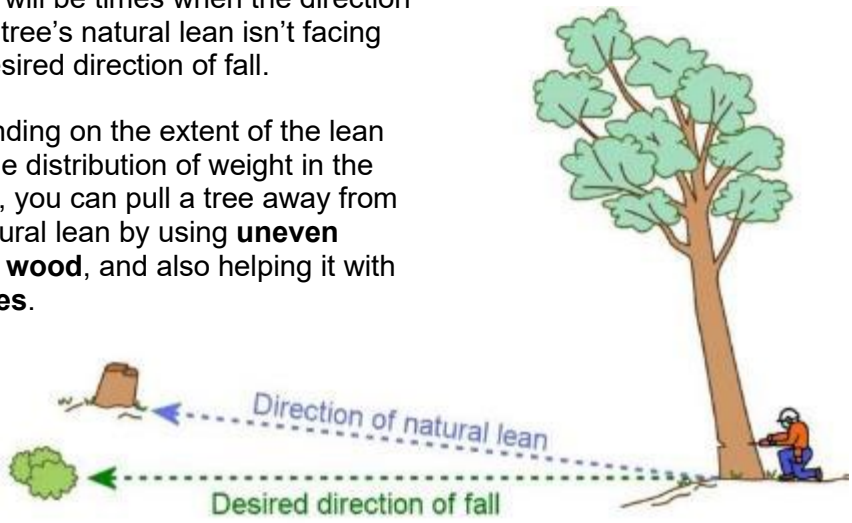
12. Falling away from natural lean

There will be times when the direction of the tree's natural lean isn't facing the desired direction of fall.

Depending on the extent of the lean and the distribution of weight in the crown, you can pull a tree away from its natural lean by using **uneven hinge wood**, and also helping it with **wedges**.

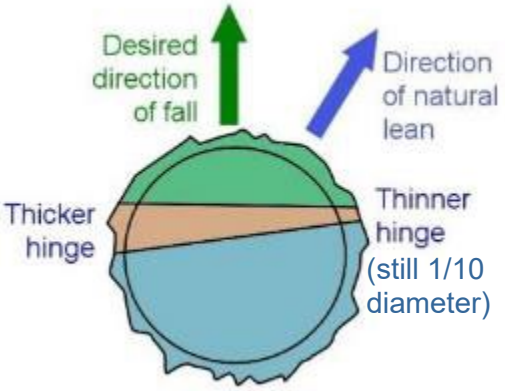


1. Cut the scarf

Do a normal scarf cut, making sure it faces the direction you want to send the tree in.

2. Cut the back cut

If it's a small tree, do a single back cut, standing on the side that's away from the lean.



Keep the hinge wood at 1/10 of the diameter thickness on the side of the lean, and make it **thicker** on the other side. The extra thickness gives that side of the hinge more strength, since it has to work against the natural lean as it pulls the tree around.

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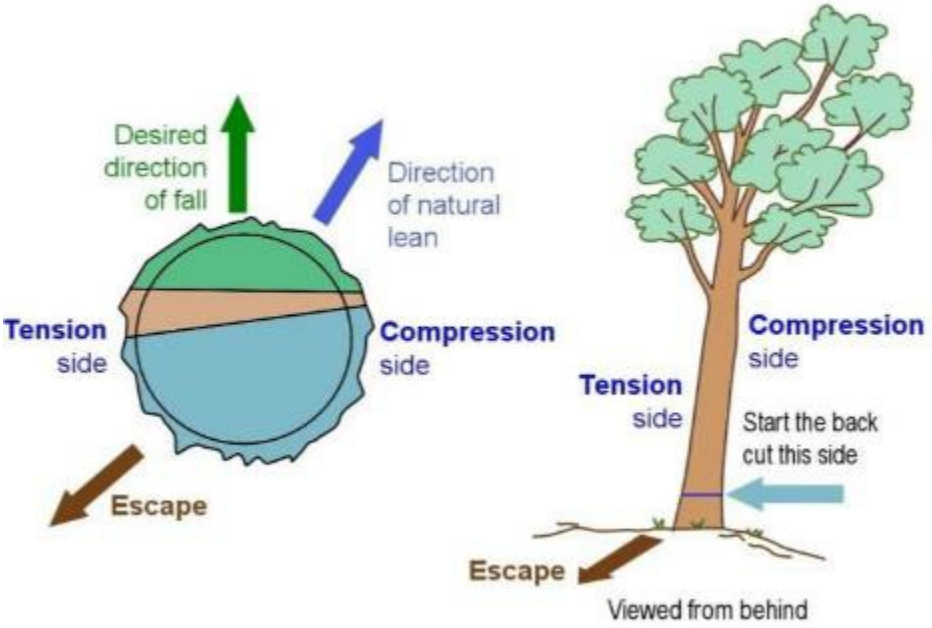
On larger trees, start the back cut on the side of the natural lean. This is the **compression side**, because the fibres are being compressed by the weight of the tree.

Continue the back cut towards the opposite side – that is, the **tension side** – where the wood fibres are being stretched. When you finish the cut, you will be in the right position to escape.

Note that the escape route is **away from the side of the lean**.



Using wedges

Wedges are useful to lift the tree away from its lean and towards the desired direction of fall.

Tap the wedge into the back cut at about **45 degrees to the scarf line**, and continue to drive it in further as you progress with the cut.

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The tree faller in this photo is using two wedges to pull a tree around to the right.

Therefore:

- **wedges will go on the left hand side**, which is the side of the natural lean
- **hinge wood will be thicker on the right**.

Types of wedges used in tree falling

As we discussed in Chapter 6, different wedges are used for different purposes. Below are the common wedges used in tree falling.

- **Short plastic wedges** are good for small trees, where you don't need much of a lift.

- **Longer, wider plastic wedges** are better if the wood is a bit spongy or soft, or if you need to lift the tree higher.

- **Aluminium wedges** are more versatile, but they can be harder to drive in on a heavy lift because of their steeper angle.

- **Steel wedges** are much more durable, but unlike the other wedges, they'll ruin the chain if you accidentally cut into them.

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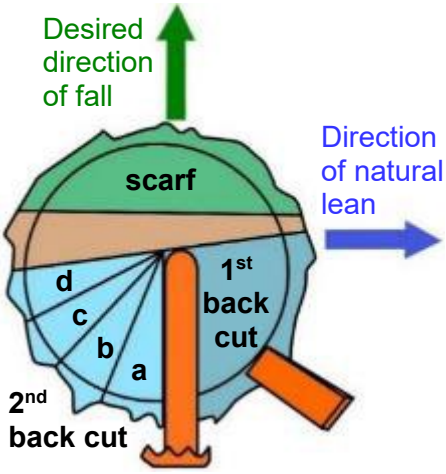
Double back cut

Double back cuts are often used to fall trees with trunk diameters that are more than the guide bar length. When you combine this technique with uneven hinge wood and wedges, you can **pull a tree up to 90° away** from its natural lean.

Below is a common technique that uses a series of **pie-shaped cuts** for the second back cut.

1. **Cut the scarf**

   Do a normal scarf cut, making sure it faces the direction you want to send the tree in.



2. **Cut the first back cut**

   Place the first back cut on the **compression side** of the tree (the side of the lean).

   Remember to make the hinge wood **thinner** on this side (but still 1/10 diameter).

3. **Start the 2nd back cut where the 1st back cut finishes**

   Turn the saw over (assuming you had the left-hand side of the saw facing downwards for the 1st back cut) and push the bar back into the cut, with the nose touching the hinge – see diagram above.

   Cut the first piece of the pie by pivoting the bar at the nose (cut '**a**').

4. **Tap a wedge into the first back cut** (as shown in the diagram)

5. **Cut another piece of the pie** (cut '**b**')

   When you've finished the second pie cut, tap the wedge in a bit further. Then insert a **second wedge** into the back of the tree, facing the scarf (where the guide bar is drawn in the diagram).

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6. Keep cutting around the quadrant for the 2nd back cut

Pivot the bar at the nose while you're cutting, like you're shutting the gate. For each new cut, tap the wedges in further so that they're helping each other to lift the tree. When you finish the last cut, drive the wedges in until the tree starts to fall.

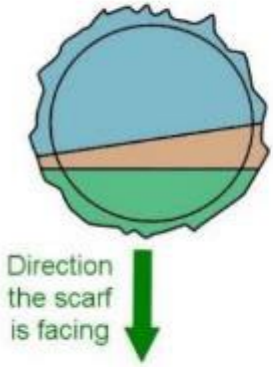
The diagram shows 4 stages in the second back cut (**a-d**), but there may be more or less, depending on the diameter of the trunk, the desired direction of fall and the degree of lean in the tree.

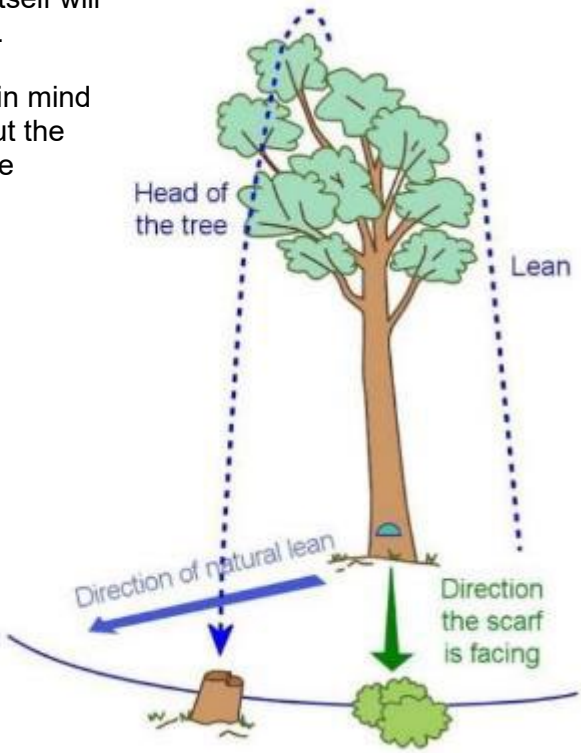
Making allowances for the line of fall

When you're using uneven hinge wood to fall a tree, you need to make allowance for the fact that the head of the tree won't fall exactly in line with the direction the scarf is facing – even after you've pulled the tree away from its direction of natural lean.

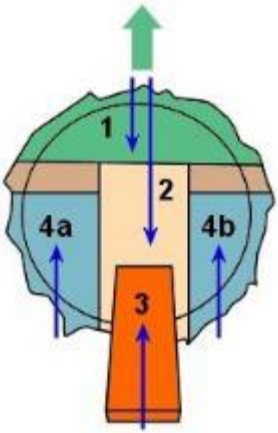
This is because the lean itself will keep the head **off-centre**.

So you need to bear that in mind when you're thinking about the exact line of fall that you're aiming for.





Pierce and wedge method



The **pierce and wedge method** is used to fall a small tree in the **opposite direction** from its natural lean.

To use this technique:

1. **Cut the scarf to 1/4 depth,** but try not to go deeper, so that you leave plenty of room for the back cut to provide wedging leverage.

2. **Put a bore cut in from the front**, sitting the bar on the flat of the scarf and going in at 90°, right through the middle and out the back.

   Make sure there is plenty of hinge wood on either side.

3. **Drive a wedge into the bore cut** from the back of the tree.

4. **Put two back cuts in the tree** either side of bore cut, placing them at the normal back cut height for that sized tree.

5. **Continue to drive the wedge in** as you work on the back cuts until the tree can be wedged over.

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