

# wilding pine

**CONTROL HANDBOOK**

*For anyone wanting to remove  
pest conifers: pines, fir and larch.*



**NATIONAL WILDING CONIFER  
CONTROL PROGRAMME**



**Environment  
Canterbury**  
Regional Council  
*Kaunihera Taiao ki Waitaha*

# About this book

This handbook is for landholders wanting to remove planted and/or wilding pines and prevent their spread.

Use it to help you identify the species that are a problem on your land, select the best method to control them and choose suitable replacement plants that deliver what you need without being invasive.

This book combines resources from across the National Wilding Conifer Control Programme (NWCCP) and we'd like to acknowledge the following for their contributions:



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# 1. Wilding pines – what’s the problem?

Wilding pines are species of conifer (pine, fir, larch) that have self-seeded and are growing where they shouldn’t.

Exotic conifers, including pines, were introduced to Aotearoa New Zealand for use as timber, shelter and erosion control. They adapted well here – their seeds can travel on the wind for many kilometres, they grow quickly and spread exponentially. They rapidly outcompete native vegetation.

If left unchecked, the rapid spread of wilding pines will transform our land into dense, impenetrable forests that in most cases can’t even be walked through.

We will lose more than just the views – we’ll lose native species, precious water resources and land for food production, tourism and recreation.

Wildfires will become more common and intense, putting lives and properties at risk.

Unlike well-managed plantation forests, wilding pine infestations are rarely a usable resource. If you want to investigate the commercial viability of mature wilding infestations eg harvesting for logs or biofuel, contact your local forestry company for advice.

## What’s being done?

Environment Canterbury has been delivering wilding pine control in Canterbury since 2003. In 2016, we partnered with the National Wilding Conifer Control Programme (NWCCP) to plan and coordinate control across Canterbury/Waitaha.

The programme is a collaboration across central and local government, industry, mana whenua, researchers, farmers and communities, led by Biosecurity New Zealand (part of the Ministry for Primary Industries).

\$37 million was invested in the NWCCP from July 2016 to June 2021. Additional investment was made in Budget 2020 with \$100 million committed over four years – this allowed national wilding pine control operations to scale up significantly and make great progress. Funding reduces to \$10 million per annum from 2023/24.

The significant reduction in funding means that landholder-led control is going to be critical if we want to win the battle against these tree weeds.

## Pest species

Not all conifer species are a problem in this region – some are more spread-prone and invasive than others.

The species listed below are responsible for most of the wilding problem we have in Canterbury/Waitaha. These are classified as pests and pest agents\* in Canterbury’s Regional Pest Management Plan (CRPMP).

Common name	Scientific name	Spreading vigour**
Douglas fir	<i>Pseudotsuga menziesii</i>	<b>Extreme</b>
Contorta/lodgepole pine	<i>Pinus contorta</i>	<b>Extreme</b>
Corsican pine	<i>Pinus nigra</i>	<b>High</b>
Mountain pine and dwarf mountain pine	<i>Pinus uncinata</i> <i>Pinus mugo</i>	<b>High</b>
European larch	<i>Larix decidua</i>	<b>High</b>
Scots pine	<i>Pinus sylvestris</i>	<b>High/medium</b>
Ponderosa pine	<i>Pinus ponderosa</i>	<b>High in low country</b>
Maritime pine	<i>Pinus pinaster</i>	<b>High in lowlands</b> <b>Low in high country</b>
Radiata pine	<i>Pinus radiata</i>	<b>High in lowlands</b> <b>Medium/low in high country</b>
Bishops pine	<i>Pinus muricata</i>	<b>Medium</b>

**Douglas fir** are used in plantation forestry under certain conditions. Unfortunately, they are extreme spreaders and their wilding seedlings are shade tolerant so if they are planted near native shrubbery the wildings don’t emerge until they are at coning age. This makes it very hard to break the cycle.

**Use the National Wilding Conifer Control Programme Wilding Conifer Quick ID guide in Appendix 1, to help you identify the most spread prone wilding pine species that should be removed.**

\*for more information on Pest Agents refer to Appendix 1 Canterbury Wilding Conifer Rules.

\*\* Medium or low spreading vigour doesn’t mean they are low priority for removal. All of the species in the table are contributing the wilding problem in Aotearoa.



## 2. Control Strategy

### Remove coning trees first

The most cost-efficient control strategy for wilding pines is to be proactive: remove seed sources – any trees that are coning – and get rid of seedlings as soon as they appear.

As soon as wilding pine seedlings produce cones they become a seed source – with some species this can happen in as little as three years.

The seeds within the cones are quickly and effectively spread by the wind. This leads to a rapid increase in the number of trees.

Seed can live in the ground for at least five to six years, known as the seed bank, so even after the seed source has been removed, maintenance work will need to be carried out to remove emerging seedlings.

## Control phases

Established infestations of wilding pines often need three or four phases of control to completely remove the established trees and those that come up from seed in the ground.

- Initial control – The first phase of any wilding pine infestation – this is the most expensive phase.
- Maintenance sweeps – Maintenance sweeps must occur within three years to address emerging trees before they reach coning age. This is crucial to break the cycle.

The first maintenance sweep can be nearly as expensive as the initial control, however subsequent maintenance sweeps should reduce in cost as the cycle is broken.

Provided the seed source has been removed most areas will require up to three maintenance sweeps after the initial control, three years apart. By this time the seed bank should be exhausted and emerging trees reduced to very small numbers.

## Considerations before starting wilding control

### What is your land use objective post-control?

Before starting you should have a general idea of how you'd like to use the site following control. This post-control goal will help determine your control objectives and will inform the control methods that will help you reach this goal.

For example, mechanical removal of wildings enables conversion to pasture, but mechanical removal could also make native restoration more costly because it may be more difficult for the native plants to establish.

### What are your local site conditions and how is land managed around your property?

You need to consider site conditions such as predominant weather patterns and the optimal time for control. Are there food-growing sites, animals, waterways or native landscapes that need to be considered in terms of access, or risks from vehicles or chemical use? You also need to consider the surrounding land use and whether there are any seed sources nearby that may continue raining seed on your controlled area.

## Are there seed sources around the area you are controlling?

If there is a significant seed source close to your project site, unless there is a plan to remove these trees soon, you will need to commit to ongoing wilding control. These could be shelter belts, amenity plantings or woodlots of species that wildings may come from. If these are present working with neighbours helps to share the financial cost and the work volume required to successfully remove seed sources.

### Some rules of thumb:

**Early control:** Early control when trees are small is always best if possible. It's the lowest cost.

**Prioritise control areas:** You, your neighbours and community will need to decide how to prioritise wilding control work in your area. Removing seed sources will limit the amount of ongoing control needed. If upwind areas are cleared first, they are least likely to be reinvaded.

**Ongoing maintenance:** Seed can live in the ground for at least five to six years, so one round of control is not enough to clear wilding pines from a site. You need to plan for an initial round of control and then several rounds of maintenance control 'once' every two – three years until you don't see any more seedlings emerging and you have removed all coning trees.

## Health and Safety

It is very important that you understand and abide by your obligations under the Health and Safety at Work Act 2015. Everyone must understand what to do to keep themselves and others safe. This may involve a Health and Safety Management Plan, wearing appropriate PPE (Personal Protective Equipment), site briefings before work commences, and reporting any incidents. You will also need to follow WorkSafe's guidance. If you are using herbicides, all application equipment must comply with the Health and Safety at Work (Hazardous Substances) Regulations 2017.

You may also need to have a fire mitigation plan (what to do on site in the event of a wildfire) depending on the site and type of work you are doing. Fire is a serious risk to workers and surrounding land. The risk of starting an accidental wildfire increases with temperature, wind, drought, low humidity and flammable vegetation.

### Further reading:

Template fire mitigation plan:

[wildingpines.nz/good-practice-guides](https://wildingpines.nz/good-practice-guides)

Fire and Emergency NZ's site on fire risk:

[fireweather.niwa.co.nz](https://fireweather.niwa.co.nz)

WorkSafe NZ website:

[worksafe.govt.nz](https://www.worksafe.govt.nz)

*WorkSafe's Approved Code of Practice for Safety and Health in Forest Operations is particularly helpful.*

# 3. Control Methods

Wilding pine control methods can be divided into two categories:

- Ground control – manual labour or mechanical.
- Aerial control – helicopters or drones.

## Which control method should I use?

Several factors will influence your decision about which control method to use:

- Density and size of trees.
- Species.
- Site factors – terrain, access, surrounding vegetation.
- Land use after control and your control objectives.
- Resources at your disposal (ie budget, use of an experienced helicopter operator).

The species of conifer can influence your choice of control method because different species produce their first cones and seeds at different ages. The age of coning also varies depending on location and microclimate. Knowing this will help you determine when to control an area and how often you'll need to do follow-up control.

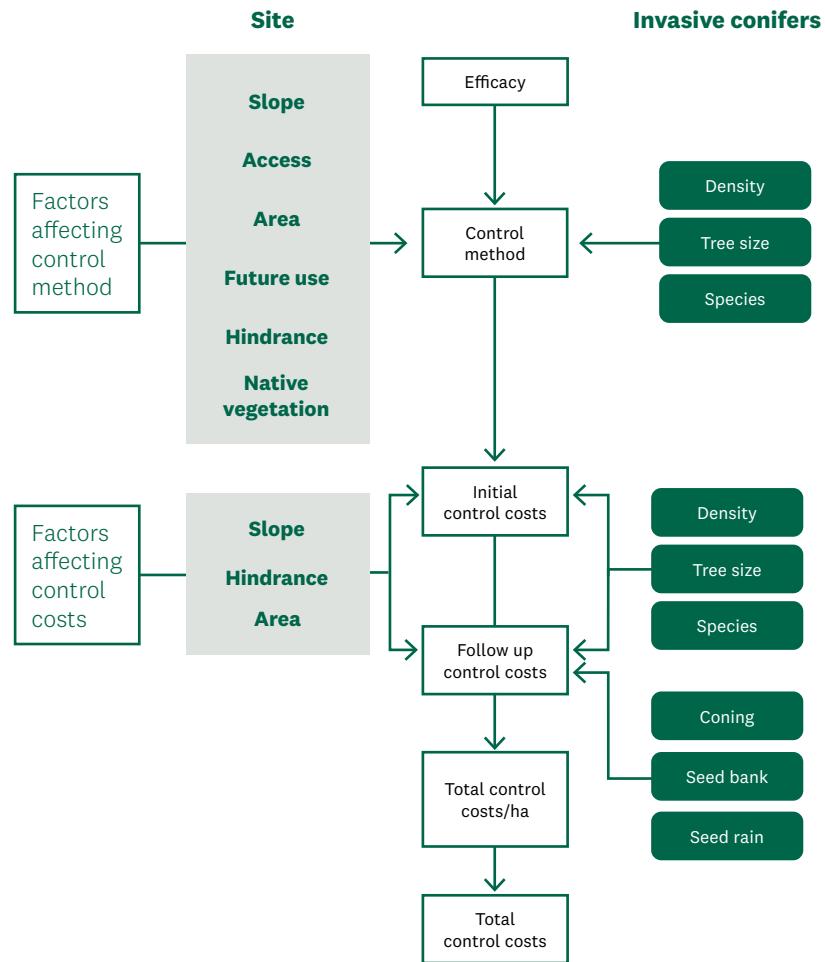
Site factors such as terrain and access will influence which control method to use too. If a site is too steep, you won't be able to use mechanical methods. If there is sensitive vegetation in or near the infestation, you'll need to be careful to protect that vegetation from any accidental damage during control particularly if it is mechanical or involves the use of herbicides. Ensure you read the best practice guides thoroughly in Appendix 2 and 3, as well as the label and safety data sheet for any herbicides before use. Some herbicides work better on some pine species than others. Know before you buy.

Some control methods may have consent and compliance costs (ie boom spraying using a helicopter), so other methods may be less expensive depending on the area.

Finally, you should factor in public and landowner support for control methods if you are working on land that is not your own.

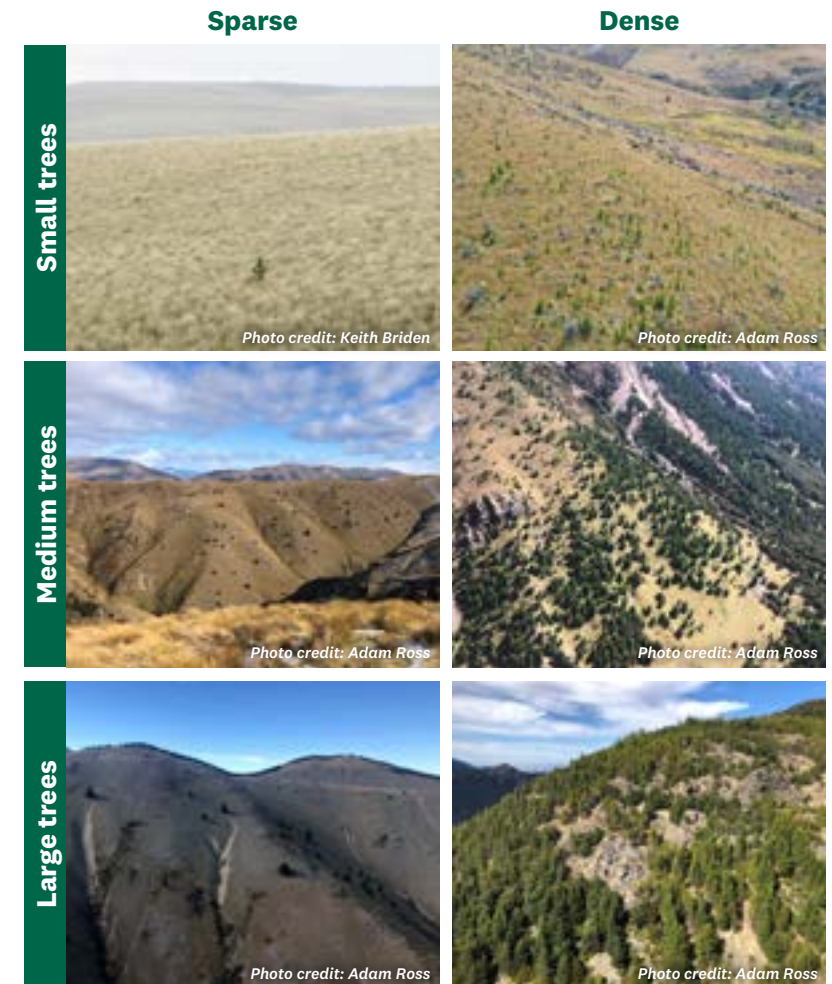


This flowchart illustrates the factors which affect the choice of control method.



Please note: hinderance means physical objects in the field that may be obstacles to clearing operations (eg boulders, vegetation density, rivers/streams), and access means ability to get to a site where control will take place.

Use the density of the infestation as a guide to selecting the right control method.



**Sparse:** isolated or small numbers of trees.

**Moderate:** you can still easily walk through them.

**Dense:** trees are packed together and it's hard to walk through them.



## Ground control

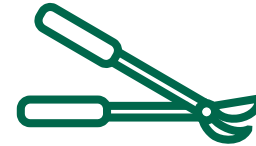
Ground control is used on accessible sites that are either easy to walk or drive too. Manual labour is used for sparse to moderate wilding densities, while mechanical control is used for dense infestations.

Wildings can be felled, pulled out by hand, or mechanically controlled in any season, subject to safety considerations (eg wasps, fire risk), whereas success with herbicide treatments can be seasonally dependent. This is because many herbicides are most effective when the trees are actively growing.



### **GO AS LOW AS YOU CAN**

*if any green material or branches are left on a stump, the tree will grow back!*



## Hand-pulling, handsaws or loppers

SEEDLINGS | SPARSE-MODERATE

**When to use:** For seedlings at a scattered density. Not suitable for adult trees or when the infestation is dense.

**How it's done:** Small seedlings (less than two years old) can usually be pulled up at the base. If the seedlings can't be pulled or they are too large, cut them at the base. It is crucial to remove all green needles and roots, so that the tree won't grow back.

**Preferred control method:** All cut stumps are followed up with herbicide application – Refer Appendix 2 – Cut stump with herbicide application.

**Tools:** Gloves and a handsaw or secateurs/loppers.

**Safety considerations:** Care must be taken when using handsaw or secateurs, and the proper technique should be used when pulling up seedlings.

**Comments:** This method preserves the quality of surrounding native vegetation the most and is best done in moist soil conditions when the complete root section can be easily pulled from the ground.



## Chainsaws/felling

MEDIUM TO LARGE | SPARSE-MODERATE

**When to use:** Useful for medium to large trees when at a scattered to moderate density on readily accessed terrain.

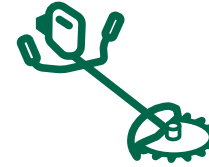
**How it's done:** Trees are felled with the chainsaw using the appropriate technique. In some instances, a small axe is useful for ensuring that all green foliage is removed close to the ground.

**Preferred control method:** All cut stumps are followed up with herbicide application – Refer Appendix 2 – Cut stump with herbicide application.

**Tools needed:** Chainsaws, associated safety and felling equipment.

**Safety considerations:** Anyone using a chainsaw must be trained, wear the appropriate safety gear, and adhere to Worksafe's Approved Code of Practice for Forestry. This method is not recommended for inexperienced people.

**Comments:** If the wilding trees are large and surrounded by native bush or shrubland, this method is not recommended, as felling can create light-gaps where new wildings can establish and can damage surrounding vegetation. Instead, use the Drill and Fill technique.



## Scrub-bar

SMALL TO MEDIUM | DENSE

**Not recommended for inexperienced people.**

**When to use:** Suitable for a wide range of wilding tree sizes, usually more effective at higher densities. Best on relatively flat terrain with few stones.

**How it's done:** Scrub-bars can cut down trees up to 15cm in diameter at the base. This method can be used in conjunction with felling by chainsaws for larger trees. Blades should always be sharp so as to make clean, quick and efficient cuts.

**Tools needed:** Scrub-bar, tungsten-tipped blades, sharpening gear, associated safety equipment.

**Safety considerations:** Anyone using a scrub-bar must be trained and wear the appropriate safety gear.



## Drill and Fill

MEDIUM TO LARGE | ANY DENSITY

**When to use:** Used for medium/large trees, often in bush or shrublands where felling can create canopy light gaps and promote new wilding establishment.

**How it's done:** Trees are drilled with a motorised drill and the holes are filled with herbicide. Large trees will require more drilled holes. It's important that drill holes go right round the whole trunk.

**Tools needed:** Motorised drill; 13-20mm bit; herbicide in spill-proof container with a suitable nozzle; associated safety equipment (gloves, safety glasses, earmuffs, appropriate clothing).

**Safety considerations:** Caution should be taken when accessing trees and using drills and herbicide. Beware of creating decaying trees in areas of human use such as near tracks, roads, buildings or fences – trees should not be drilled where they will become a hazard to human safety if they fall.

**Comments:** For more information about Drill and Fill, hole size/spacing, and which herbicide to use, please refer to Appendix 3 – Ground based herbicide injection – Drill and Fill.



*Wilding pines require specific herbicides depending on species and control method.*



## Ground-based Basal Bark Application (GBBA)

MEDIUM | SPARSE

**When to use:** Most useful for medium-sized soft-bark trees with readily accessible stems, where scattered infestations can be reached on foot.

**How it's done:** Chemical is sprayed directly onto the bark of trees and must be applied around the circumference of the whole tree. Note: Can be difficult to ensure that all trees have been treated (compared to felled trees). If you miss a section of trunk the tree may not die completely.

**Tools needed:** Knapsack sprayer; associated safety equipment (gloves, safety glasses, appropriate wrist to ankle cover clothing).

**Safety considerations:** Caution should be taken when spraying trees to avoid splash-back or non-target impacts; care should be taken with mixing chemicals and only water-tight containers should be used to avoid spillage. Those mixing and applying the herbicide should have the proper training to do so.



*Find out more in the Good Practice Guides in the appendices.*



## Mechanical (mulching or removal via a digger/bulldozer)

SMALL TO MEDIUM | DENSE

**When to use:** For dense wilding stands. Mulching can be used for small to medium sized trees, and diggers/bulldozers can clear medium to large sized trees. In some instances, wilding trees can also be logged for timber.

**How it's done:** Only for use by skilled and appropriately trained operators. On uneven ground mulching may not remove lowest green branches, leaving the risk of regrowth. If clearing wildings using a digger or bulldozer, wildings can be cleared into windrows. This is not recommended unless replanting because this method will disturb the soil and can create ideal conditions for new wilding seedlings. In such circumstances, it is vital to consider vegetation successions (ie sow desired seed or arrange for follow-up wilding control).

**Tools needed:** Heavy machinery – for use only by skilled professional operators.

**Safety considerations:** Care must be taken to ensure the site is suitable for mechanical control. If windrows are left on site, consider the residual risk of increased fire intensity and the challenge of accessing wilding seedlings which come up in the soil amongst the windrows.



## Burning

SMALL TO MEDIUM | MODERATE TO DENSE

**When to use:** Conducting a safe burn is a major operation, requiring an experienced and qualified team. Suitable for privately owned land subject to consent processes. Can be a cheap control method for small to medium-sized wildings at moderate to dense stockings.

**How it's done:** Requires regional council consent and an approved prescribed burn plan and permit from Fire and Emergency NZ. It may also require a Wildlife Act permit from DOC if there are lizards on site. Some burn operations spray trees several months in advance to dry out foliage.

**Tools needed:** All appropriate equipment and labour to contain a fire to the target area.

**Safety considerations:** The landowner must have the required consents and an approved prescribed burn plan and permit. The team carrying out the burn also must adhere to the fire permit rules and ensure the safety of all involved in the burn. This technique is not for amateurs and should not be used in an area where there is sensitive native vegetation.



## Aerial Control

Aerial control is used for sites which are less accessible, have very sparse infestations, or are dense infestations that cannot be mechanically controlled.

Since herbicide treatments are used in aerial control, these control techniques are applied during the growing season between spring and autumn. The growing season will depend on the site. For example, in southern and inland montane areas the most effective time is from November to February. Variable results can be expected if chemicals are applied outside this period.

For some sites, both ground and aerial control may be suitable, but helicopters may be preferred over ground control. This may be due to steep or rugged terrain, and/or large sparse trees, making it unsafe or uneconomical for ground control. The site may be a dense infestation of wildings which cannot be logged or mulched.

In some instances, helicopters may be used to transport ground crews to a site to complete control work. In this instance, the helicopter transport provider should advise and follow relevant safety procedures including a briefing before entering the helicopter. You will need to find out any pre-flight safety requirements and any limitations on the equipment you can take, before the day of the flight.



## ABBA (Aerial Basal Bark Application)

SMALL TO MEDIUM | SPARSE

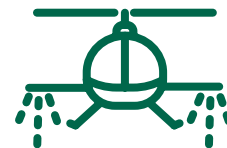
**When to use:** Scattered infestations of small to medium-sized trees, particularly if the site covers a large area. ABBA may also be used if the site is particularly steep or hazardous.

**How it's done:** Only for use by skilled operators. The stems of wilding trees are sprayed via a wand from a helicopter, making this technique very targeted. The chemical used will depend on the target wilding tree species.

**Tools needed:** Experienced helicopter pilot must abide by CAA regulations and use appropriate safety gear.

**Safety considerations:** All appropriate precautions when using helicopters must be followed, and spraying herbicide over any flowing waterway must be avoided. Monitor weather conditions on the day of spraying to avoid non-target damage and spray back onto the helicopter. This technique should only be used by skilled operators.

**Comments:** For more information about ABBA, please refer to the Good Practice Guide of the National Wilding Conifer Control Programme – [wildingpines.nz/good-practice-guides](http://wildingpines.nz/good-practice-guides).



## AFSA (Aerial Foliar Spray Application)

LARGE | DENSE

**When to use:** Dense, closed canopy infestations. AFSA can also be used for spot spraying of scattered infestations of small to medium trees.

**How it's done:** Only for use by skilled operators. The needles of the wilding trees are sprayed from a boom on a helicopter.

**Tools needed:** Experienced helicopter pilot must abide by CAA regulations and use appropriate safety gear.

**Safety considerations:** All precautions about the use of helicopters must be followed, and all flowing waterways must be avoided. Weather conditions must be monitored on the day of spraying to minimise spray drift. This technique should only be used by skilled operators, and you may also need consent from your regional council.

**Comments:** For more information about AFSA, please refer to the Good Practice Guide of the National Wilding Conifer Control Programme – [wildingpines.nz/good-practice-guides](http://wildingpines.nz/good-practice-guides).

## 4. Control Costs

It is difficult to cost out wilding control operations because there are many factors that influence both the choice of control method and the cost, including tree size and density of the infestation, the terrain of the site and access, and the conifer species.

The table below shows approximate costs of control per hectare, valid in 2023, for some of the main control techniques, although please note that costs can vary widely depending on the site.

Control costs should consider both the cost of initial control and the maintenance. Often, the first round of follow-up maintenance can cost almost as much as the initial control, but costs will subsequently decrease as the seedbank depletes and fewer trees grow at the site.

Control Method	Density	Cost p/ha
Felling with a chainsaw	Sparse	\$50
	Moderate	\$500 - 2,000
Cut stump	Sparse	\$100 - 250
	Moderate	\$500 - 1,500
Drill and Fill	Sparse	\$50
	Moderate	\$500 - 1,500
	Dense	\$1,500 - 3,000
Scrub bar/grubbing	Moderate/Dense	\$750
Mechanical control - bulldozer or mulching	Moderate/Dense	Can be cost neutral
ABBA	Sparse	\$30 - 100
AFSA	Dense	\$2,000 - 2,500



# 5. Post-control options

## What's your vision for the site?

After wildings are removed from a site, it's common for exotic plant species to establish and thrive. If you want to avoid this, it's important to think about the vision for a site before you start your control activity. Your choice of control method can assist you with reaching your land-use goal.

You will need to determine which land-use type best suits the land and land tenure and consider the available seed sources of surrounding vegetation (native or introduced). It is also possible to initially transition the land to one land-use type (ie pasture) before converting it to another. All required resource consents should be obtained where needed. We also recommend you avoid planting any of the 10 species listed in the CRPMP – see page 6.

**The following options are recommended for post-control land-use:**

### 1. Native restoration

Native restoration can either be active or passive. Regardless of which technique (or combination of) is used it's important to consider that wildings leave a legacy in the soil. This facilitates their reinvasion as well as other weeds at a site. Therefore, weed and pest control will be needed to protect and encourage the establishing native vegetation, especially through the first five years post-control.

**Passive restoration** means managing the site so that native restoration is encouraged and occurs without intensive support/replanting. It is essential there's a well-established native seed source near the site. The vegetation will likely revert to its natural surrounding cover (ie tussock grassland, or native shrubland) in time. Be aware this is a long-term process!

In situations where there is existing native shrubland or forest, using the Drill and Fill control method to control wilding pines will complement passive restoration as it will minimise any disturbance on the site. You will likely need to do some maintenance/weed control to remove any re-emerging wildings or other invasive weeds that establish, until native regeneration reaches a point of canopy closure or full ground cover.

Passive restoration is not recommended for tussock grassland sites where there is a significant wilding pine seed source remaining nearby.

**Active restoration** means direct planting of native vegetation. It can be expensive and labour-intensive but is a significantly faster method of establishing native cover and is necessary for sites where there is no native seed-source nearby.

To maximise survival rates, it is important to eco-source the seeds from local seed sources as they are best adapted to your conditions.

Allow sufficient time to source the native plants you need – it might take months or even a year for them to be a suitable size for planting, especially if you're ordering a large volume.

Plant protection like guards or weed matting is also recommended to help boost survival rates and reduce weed control requirements.

## 2. Pasture/grazing

Over-sowing pasture grasses can be a very effective land-use option to prevent reinvasion of wildings, in areas suited for pastoral land-use. Mechanical control, logging, and mulching are effective control techniques that can allow for wilding tree sites to transition well into grazing paddocks. Be sure to apply for and get approval for the required resource consents. This land use type may not be suitable for all land tenures.

## 3. Plant non-spreading trees

You may want to plant an area in plantation forestry or plant amenity or shelter trees after you control wildings. This includes options for re-establishing shelterbelts that may have been producing wildings.

Make sure you plant non-spreading trees and follow normal good plantation establishment practices. District Councils may also have rules around what trees can be planted, so it is best to check and obtain consents where needed.

Wilding regeneration can be expected amongst planted trees and needs to be controlled.

### **REPLANTING**

*There are lots of great planting resources online, it is also a good idea to check what works locally with neighbours and local plant nurseries. **Check out Appendix 4 for The Right Tree for Your Place guide.***

#### 4. Maintain tussock grasslands

(Only suitable for areas where there were tussocks before wilding infestation).

If there is no nearby wilding pine seed source, it is possible to revert land back to tussock grasslands if that was the land cover before wilding infestation. However, tussock grasslands can often be invaded by many types of exotic grasses and woody vegetation, so vigilant maintenance and protection may be required.

## National Programme partner websites for Waitaha/Canterbury

- Environment Canterbury  
[ecan.govt.nz/wildingpine](http://ecan.govt.nz/wildingpine)
- Wilding Pine Network  
[wildingpinenetwork.org.nz](http://wildingpinenetwork.org.nz)
- National Wilding Conifer Programme website  
[wildingpines.nz](http://wildingpines.nz)
- Wilding Free Mackenzie Trust  
[mackenziewildingtrust.org](http://mackenziewildingtrust.org)
- WELRA (Waimakariri Ecological and Landscape Restoration Alliance)  
[wildingpinenetwork.org.nz/community-groups](http://wildingpinenetwork.org.nz/community-groups)



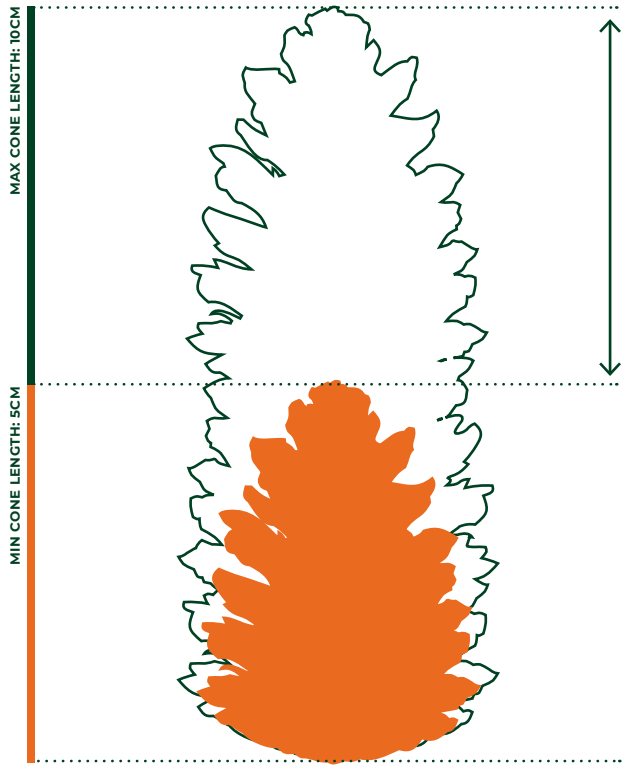
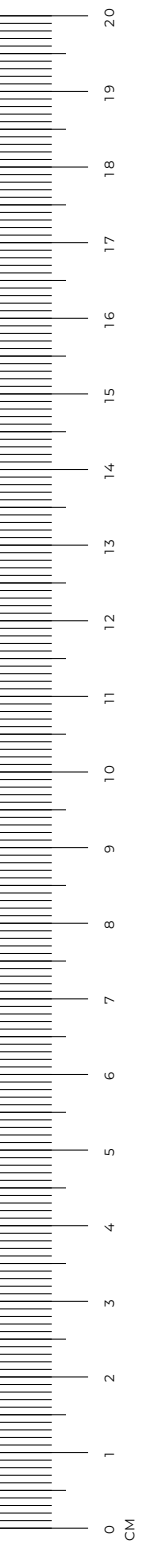
# WILDING CONIFER QUICK ID GUIDE



NATIONAL WILDING CONIFER  
CONTROL PROGRAMME

KŌTĀTĀU THIS IS US

# CONTENTS



**WE'VE ADDED A SCALE AGAINST EACH SPECIES TO SHOW THE APPROXIMATE SIZE OF IT'S CONE**



## 3 SINGLE NEEDLES

- 3 Douglas Fir
- 3 Silver Fir
- 4 Sitka Spruce



SINGLE NEEDLES

## 4 TWO NEEDLES (SHORT)

- 4 Lodgepole Pine
- 5 Jack Pine
- 5 Scots Pine
- 6 Dwarf Mountain Pine
- 6 Mountain Pine



TWO NEEDLES (SHORT)

## 7 TWO NEEDLES (MEDIUM/LONG)

- 7 Bishop Pine
- 7 Black Corsican Pine
- 8 Maritime Pine



TWO NEEDLES (MEDIUM/LONG)

## 8 THREE NEEDLES

- 8 Ponderosa Pine
- 9 Radiata Pine
- 9 Mexican Weeping Pine



THREE NEEDLES

## 10 FIVE NEEDLES

- 10 Western White Pine
- 10 Eastern White Pine (Weymouth Pine)



FIVE NEEDLES

## 11 CLUSTER NEEDLES

- 11 European Larch
- 11 Japanese Larch
- 12 Deodar Cedar



CLUSTER NEEDLES



MAX: 18CM



## DOUGLAS FIR

*Pseudotsuga menziesii*

### SINGLE NEEDLES

1–2cm long. Flat, soft, pale on underside, orange scented when crushed.

### CONE

5–10cm long. Three-pronged scales.

### BARK

Thin, smooth and grey, with resin blisters, becoming thick, deeply grooved with dark reddish-brown ridges.

### SPREADING VIGOUR

Extreme.

MAX: 10CM

MIN: 5CM



MIN: 9CM



## SILVER FIR

*Abies alba*

### SINGLE NEEDLES

1.8–3cm long. Flat, soft, pale on underside.

### CONE

9–18cm long, sit upright on the branch.

### BARK

Dark grey and smooth with resin blisters that break into square plates with age.

### SPREADING VIGOUR

Low/Medium.



IMAGE: © MIKE PATTERSON / PHOTO 6608953/CC BY-NC

MAX: 10CM



## SITKA SPRUCE

*Picea sitchensis*

### SINGLE NEEDLES

1.5–2.5cm long and sharp.

### CONE

5–10cm long. Pale-brown drooping with thin, flexible scales.

### BARK

Grey, smooth, thin, becoming dark purplish-brown with scaly plates with age.

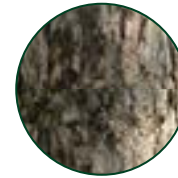
### SPREADING VIGOUR

Low/Medium.

MIN: 5CM



MAX: 6CM



## LOGEPOLE PINE

*Pinus contorta*

### TWO NEEDLES (SHORT)

2.5–6.5cm long. Yellow-green to dark green; rigid with a short horny point, often twisted and forward pointing.

### CONE

3–6cm long. Scales end in a slender prickle.

### BARK

Reddish-brown, grey on surface, fissured and forming small plates.

### SPREADING VIGOUR

Extreme. The most vigorous spreading conifer species in New Zealand.

MIN: 3CM



## JACK PINE

### *Pinus banksiana*

#### TWO NEEDLES (SHORT)

2.5–4cm. Yellowish to green colour.

#### CONE

2–5cm long. Irregular shape, flat or curved on one side.

#### BARK

Grey with red-brown, scaly patches.

#### SPREADING VIGOUR

Low/Medium.

MAX: 5CM

MIN: 2CM



## SCOTS PINE

### *Pinus sylvestris*

#### TWO NEEDLES (SHORT)

4–7cm long. Grey-blue tinge – can look silvery.

#### CONE

3–6cm long on a short stalk.

#### BARK

On lower stems thick, scaly-plated, grey-brown; on upper stems and branches, thin, flaking and orange-red.

#### SPREADING VIGOUR

High.

MAX: 6CM

MIN: 3CM



## DWARF MOUNTAIN PINE

### *Pinus mugo*

#### TWO NEEDLES (SHORT)

3–7cm long. Stiff – like a scrubbing brush.

#### CONE

3–5cm long. No spines with scales hooked back.

#### BARK

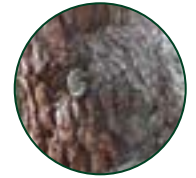
Varies from pink to brown-grey, fissured and broken into irregular small, curled-up plates.

#### SPREADING VIGOUR

High.

MAX: 5CM

MIN: 3CM



## MOUNTAIN PINE

### *Pinus uncinata*

More upright than dwarf counterpart.

#### TWO NEEDLES (SHORT)

3–7cm long. Stiff – like a scrubbing brush.

#### CONE

3–5cm long. Recurved cone scales, but no spines.

#### BARK

Ash grey-brown to black-grey, splitting into angular scaly plates.

#### SPREADING VIGOUR

High.

MAX: 5CM

MIN: 3CM



## BISHOP PINE

*Pinus muricata*

### TWO NEEDLES (MED/LONG)

7–16cm long. Bluish tinge.

### CONE

4.5–8cm long. Arranged in whorls around branches. Spiky scales.

### BARK

Dark grey, deeply furrowed into long ridges, scaly-plated.

### SPREADING VIGOUR

Medium.

MAX: 8CM

MIN: 4.5CM



## BLACK CORSICAN PINE

*Pinus nigra*

### TWO NEEDLES (MED/LONG)

8–16cm long. Can be 3 needled. Grey-green or bluish-green, grooved on opposing sides.

### CONE

5–8cm long. Scales end in tiny prickles.

### BARK

Dark grey, breaking into longitudinal ridges, small scaly plates.

### SPREADING VIGOUR

High.

MAX: 8CM

MIN: 5CM



## MARITIME PINE

*Pinus pinaster*

### TWO NEEDLES (MED/LONG)

6–17cm, dull green.

### CONE

7–16cm long. Purplish when very young, becoming shiny brown with age; weathering to grey-brown.

### BARK

Thick, deeply fissured and forming small irregular plates with smooth dark red or reddish-brown surfaces.

### SPREADING VIGOUR

Low in high country.  
High in lowlands.

MAX: 16CM

MIN: 7CM



## PONDEROSA PINE

*Pinus ponderosa*

### THREE NEEDLES

13–25cm long. Can also be 2, 4 or 5 needles, stiff.

### CONE

8–14cm long. Spines on scales.

### BARK

Thick, large, smooth, rectangular plates on mature trees. Reddish-brown or reddish-pink to orange-yellow in colour.

### SPREADING VIGOUR

High/Medium.

MAX: 14CM

MIN: 8CM



## RADIATA PINE

### *Pinus radiata*

Most commonly planted pine in NZ.

#### THREE NEEDLES

9–13cm long. Dark green.

#### CONE

7–15cm long. Held in clusters of up to 6.

#### BARK

Thin and brown, developing deep, mainly vertical, fissures with age.

#### SPREADING VIGOUR

Low/medium in high country. High in lowlands.



## MEXICAN WEEPING PINE

### *Pinus patula*

#### THREE NEEDLES

15–30cm long, thin, flexible, drooping below branches; grass-green colour.

#### CONE

7–10cm long. Reddish-brown colour, held singly or in small clusters.

#### BARK

Red-brown bark that peels easily with orange-brown under bark.

#### SPREADING VIGOUR

Medium.

LEFT IMAGE: ©Kate\_mcalpine inaturalist 73818647/CC BY



IMAGE: ©Bill Finch/inaturalist 1027676/CC BY-NC-ND



## WESTERN WHITE PINE

### *Pinus monticola*

#### FIVE NEEDLES

4–13cm long, blue-green with blunt tip and solid feel.

#### CONE

7–25cm long.

#### BARK

Grey-purple and smooth, becoming grey-brown, divided into rectangular, scaly plates with age.

#### SPREADING VIGOUR

Medium/Low.



## EASTERN WHITE PINE (WEYMOUTH PINE)

### *Pinus strobus*

#### FIVE NEEDLES

6–14cm long. Blue-green to dark green, soft and flexible, tending to droop.

#### CONE

7–20cm long. Light yellowish brown, very resinous.

#### BARK

Smooth, grey-green to grey-brown, becoming darker and ridged into rectangular plates with age.

#### SPREADING VIGOUR

Medium/Low.





## EUROPEAN LARCH

### *Larix decidua*

#### CLUSTER NEEDLES

2–4cm long and held in dense whorls. Grass-green but is deciduous so needles turn bright yellow and drop in the autumn.

#### CONE

2.5–4cm high and upright. Female cones are crimson-red, maturing to brown. Male cones are yellow.

#### BARK

Pink-brown and thick, developing wide vertical fissures with age.

#### SPREADING VIGOUR

High.

MIN: 2.5CM  
MAX: 4CM



## JAPANESE LARCH

### *Larix kaempferi*

#### CLUSTER NEEDLES

2–5cm long. Light green but like European Larch, needles turn bright yellow and drop in the autumn.

#### CONE

1.5–3.5cm long. Violet maturing to orange-brown

#### BARK

Smooth, red-brown, becoming scaly, fissured and grey with age.

#### SPREADING VIGOUR

High.

MIN: 1.5CM  
MAX: 3.5CM



## DEODAR CEDAR

### *Cedrus deodara*

#### CLUSTER NEEDLES

2.5–5cm long, grow in small, dense clusters on short shoots, bright green to blue-green color.

#### CONE

7–13cm long, barrel cones.

#### BARK

Smooth but becomes rough with grooves and irregular, grey coloured scales with age.

#### SPREADING VIGOUR

Low/Medium.

MAX: 13CM

MIN: 7CM

## WHAT ARE WILDING PINES?

Wilding conifers (also called wilding pines) refers to self-seeded trees from several species of fir, spruce, larch and pine that are growing where they are not supposed to be. Wilding pines pose a big threat to New Zealand's unique environment. Unlike well managed planted forests, wilding infestations don't allow for native undergrowth, are not managed for fire risk, and are rarely a usable resource.

## WHAT'S BEING DONE?

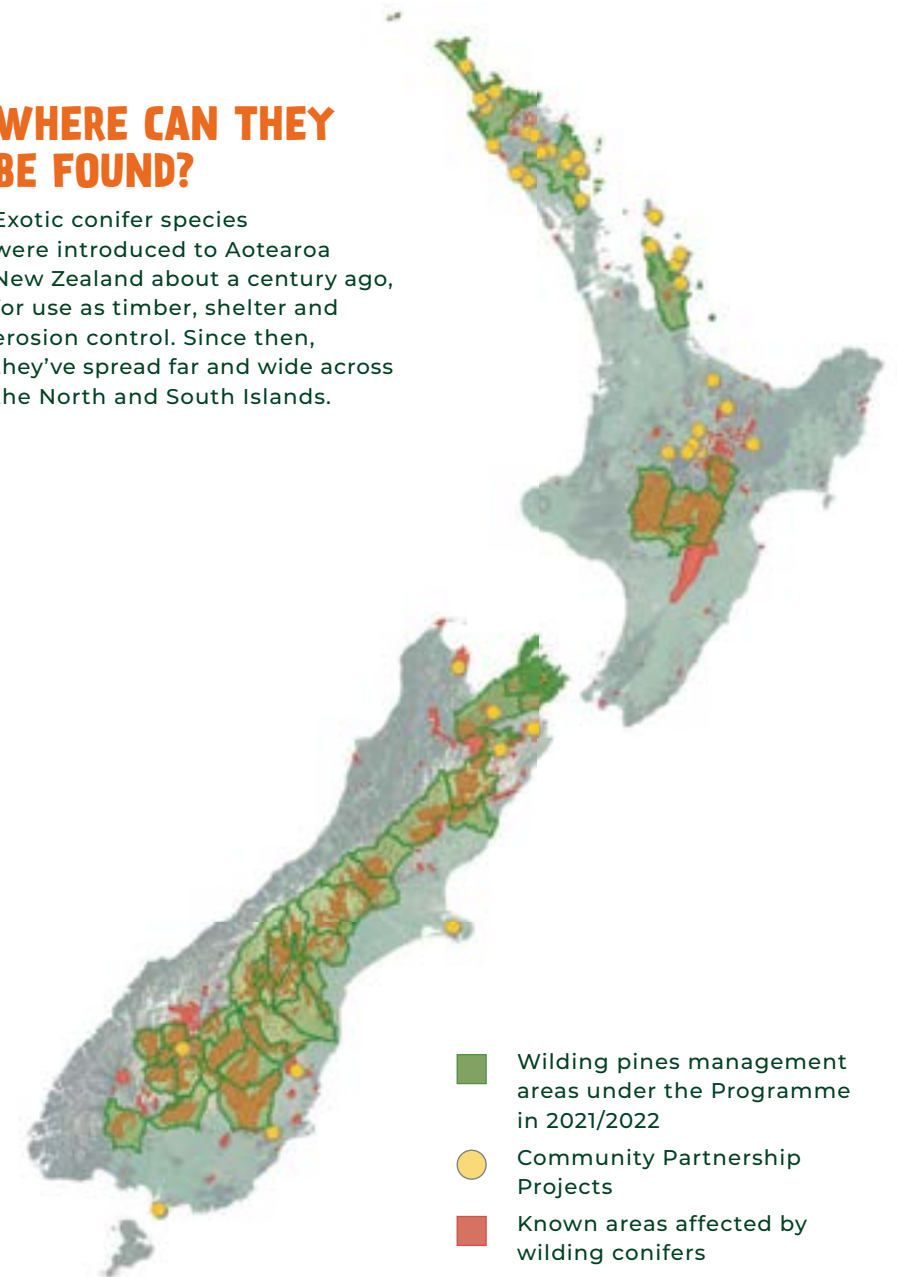
The National Wilding Conifer Control Programme led by Biosecurity New Zealand, helps coordinate and support the efforts of New Zealanders working to tackle this significant national problem. Programme partners include central and local government, Iwi, Hapū, Rūnanga, researchers, landowners and community groups. Local volunteers also play a big part in controlling wilding pines.

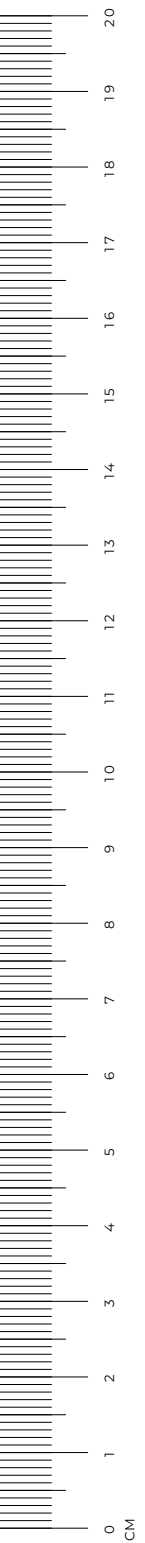
## WHAT CAN YOU DO?

- Be careful when selecting which tree species to plant, and where – check with your regional council.
- Remove wilding pine seedlings and saplings that have established outside planted areas, before they develop cones.
- Work with neighbours to control wilding pines that have spread across property boundaries.
- When hunting, hiking or just enjoying the outdoors, you can pull out small wilding pine seedlings or cut small trees close to the ground and remove all green needles from the stump. These trees can be left on site to break down naturally.
- Businesses can sponsor community projects and help spread the word.
- Anyone can join (or start) a community group helping to control wilding pines or spread the word on social media – check out the videos and images you can use from the [www.wildingpines.nz](http://www.wildingpines.nz) website.

## WHERE CAN THEY BE FOUND?

Exotic conifer species were introduced to Aotearoa New Zealand about a century ago, for use as timber, shelter and erosion control. Since then, they've spread far and wide across the North and South Islands.

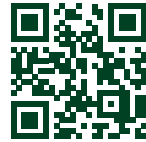




### VIEW INFESTATIONS

View wilding conifer infestations in your region.

[WILDPINES.LINZ.GOV.T.NZ](http://WILDPINES.LINZ.GOV.T.NZ)



### MANAGEMENT AND CONTROL

Visit iNaturalist NZ – Mātaki Taiao to record what you see in New Zealand nature.

[INATURALIST.NZ](http://INATURALIST.NZ)

**DISCLAIMER:** While we have made every effort to ensure the information is accurate, the National Wilding Conifer Control Programme does not accept any responsibility or liability for error of fact, omission, interpretation or opinion that may be present, or for the consequences of any decisions based on this information.

Information provided around spread vigour is indicative only and based on observations by the Programme. For region specific risk, refer to the regional council regional pest management plan for your area.



APPENDIX 2

# CUT STUMP WITH HERBICIDE APPLICATION – 'CUT STUMP'

VERSION 1: NOVEMBER 2021

Cut stump is a control method that involves cutting a tree down and applying herbicide to the cut stump to prevent regrowth. It is suitable for the control of trees which are accessible from the ground and where the risk of damage to surrounding vegetation is minimal or not a concern.

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Photograph front cover: Cut Stump method in action. (Photo source: Adam Ross)

# ABOUT THIS DOCUMENT

Overall disclaimer:	<p>The information in this publication represents the collective view of the National Wilding Conifer Control Programme (the 'National Programme'). We have made every effort to ensure the information is accurate. However, the National Programme does not accept any responsibility or liability for error of fact, omission, interpretation or opinion, nor for the consequences of any decisions based on this information.</p> <p>Good practice use by any reader is done so at their own risk, and the National Programme rejects all liability for any risk or loss as a result of applying this good practice information.</p> <p>This guide is not designed to provide exhaustive compliance information and is not a substitute for professional advice. It remains the full responsibility of the user to obtain the specific guidance, authorisations, consents and permits as required to meet regulatory requirements and complete the work.</p>
Acknowledgements:	We thank the Department of Conservation, R&D Environmental Ltd, and the National Programme's Technical and Operational Advisory Groups for sharing their knowledge and expertise.
Principal author:	Biosecurity New Zealand (Ministry for Primary Industries)
Document Owner:	Wilding Conifer Programme Manager, Biosecurity New Zealand (Ministry for Primary Industries)
Approved for distribution and use:	Operational Advisory Group, Technical Advisory Group (National Wilding Conifer Control Programme)
Last reviewed:	November 2021
Classification / status:	[Version 1]
Document reference:	[Good Practice Cut Stump V1 November 21]
Comments and suggestions	Email to: wilding.conifers@mpi.govt.nz

## VERSION CONTROL

Date	Details	Version no.
November 2021	Draft finalised and published	Version 1

### This document should be read in conjunction with:

**WorkSafe** - Working safely with chemicals and fuels on farms

**WorkSafe** - HSNO codes of practice for hazardous substances

NZ Standard for Management of Agrichemicals NZS 8409:2021

Approved Code of Practice for Safety and Health in Forest Operations

Health and Safety at Work (Hazardous Substances) Regulations 2017

# 1. CUT STUMP MATERIALS

## 1.1 EQUIPMENT RECOMMENDATIONS

Below are recommendations for equipment for set-up and delivery.

EQUIPMENT TYPE	RECOMMENDATIONS	IMPORTANT CONSIDERATIONS
<b>Cutting</b>	Loppers, secateurs, handsaw, scrub cutters or chainsaw.	Follow WorkSafe's <a href="#">Approved Code of Practice for Safety and Health in Forest Operations</a> and any associated best practice guidelines.
<b>Herbicide Application</b>	<ul style="list-style-type: none"> <li>• A bottle fitted with an applicator brush; or</li> <li>• A handheld sprayer; or</li> <li>• A backpack applicator</li> </ul>	All application equipment must comply with the Health and Safety at Work (Hazardous Substances) Regulations 2017.
<b>Personal Protective Equipment</b>	<p>If using loppers or secateurs:</p> <ul style="list-style-type: none"> <li>• Boots with ankle support that are appropriate for the terrain</li> <li>• Safety glasses</li> <li>• Gloves</li> </ul> <p>If using a handsaw:</p> <ul style="list-style-type: none"> <li>• Long pants or knee length gators</li> <li>• Boots with ankle support that are appropriate for the terrain</li> <li>• Safety glasses</li> <li>• Gloves</li> </ul> <p>If using scrub cutters:</p> <ul style="list-style-type: none"> <li>• Chaps or chainsaw protective pants</li> <li>• Chainsaw resistant boots with steel-capped toes</li> <li>• Face visor/safety glasses</li> <li>• Radio communication</li> </ul>	<p>Follow guidance on the Safety Material Data Sheet.</p> <p>It is the Programme's view that if the SDS "recommends" or "advises" that a particular type of PPE be used when applying chemical, then this <b>must be used</b>.</p> <p>Follow WorkSafe's Approved Code of Practice for Safety and Health in Forest Operations</p> <p>All chainsaw and scrub cutter operators <b>must</b> be in constant radio contact with another person.</p>

	<p>If using a chainsaw:</p> <ul style="list-style-type: none"> <li>• Chaps or chainsaw protective pants</li> <li>• Chainsaw resistant boots with steel-capped toes</li> <li>• Face visor/safety glasses</li> <li>• Hearing protection</li> <li>• Safety helmet</li> <li>• Radio communication</li> </ul> <p>When handling, mixing, or applying herbicide, or when cleaning associated equipment:</p> <ul style="list-style-type: none"> <li>• Safety glasses</li> <li>• Chemical resistant gloves (refer to SDS sheet)</li> <li>• Waterproof boots</li> <li>• Cotton overalls fastened up to the neck and wrist (if spraying herbicide)</li> <li>• Mask or respirator (if recommended by the SDS)</li> </ul>	
<b>Other</b>	<ul style="list-style-type: none"> <li>• A fire extinguisher - chainsaw operators only</li> <li>• A First Aid kit with saline eye wash must be available for operators. Chainsaw operators must carry first aid kits which includes two large wound dressings as per the ACOP.</li> </ul>	Wherever the fire risk is above 'Low' on the Fire Danger Class System, fire extinguishers must be carried.

## 2. HERBICIDE CHOICE AND USAGE

### 2.1 TRAINING

General instruction, supervision and training requirements are provided in the Health and Safety at Work (General Risk and Workplace Management) Regulations. The Hazardous Substances Regulations go further to state what a business needs to do to ensure that every worker who uses, handles, manufactures or stores a hazardous substance has the knowledge and practical experience to do so safely.

Employers have a duty to train employees (or make sure someone who is trained supervises them) so they can do their work safely. The Site Lead (or equivalent role as named in the relevant Site Specific Safety Plan) for a drill and fill operation must make sure that everyone using chemicals is appropriately trained.

**Note, a GROWSAFE standard certification is needed for any worker using metsulfuron methyl, picloram, or triclopyr BEE.**

### 2.2 RECOMMENDED HERBICIDE

Note: Before application refer to and follow the directions of the products Safety Material Data Sheet.

	Picloram gel (43 g/L or stronger)	Glyphosate gel (240 g/L or stronger)	Metsulfuron gel (10 g/L or stronger)	20% basal bark mixture
<b>Situation of Use</b>	All species. Follow label recommendations for application use			
<b>Recommended Mixing</b>	Apply directly from bottle.	Apply directly from bottle.	Apply directly from bottle.	<ul style="list-style-type: none"> <li>200 mL of 600 g/L triclopyr butoxyethyl ester (triclopyr BEE) herbicide</li> <li>800 mL of vegetable oil.</li> </ul> Or a pre-mixed product such as X-Tree Basal Wet and Dry.

## 3. CUT STUMP METHOD

### 3.1 BEST TIME OF YEAR TO CUT STUMP

Cut Stump can be used throughout the year.

### 3.2 METHOD

#### CUTTING

- Cut the stump using a handsaw, loppers or scrub cutters for a small sapling, and a chainsaw for larger trees.
- Cut the stump as close to the ground as possible (ideally no higher than 10cm, although this may not be possible in steep terrain). Try not to have more than one green whorl below the cut stump.
- Try to achieve a clean cut. Cut the stumps so they are approximately level to facilitate uniform coverage of the herbicide mixture.
- All branches must be removed from the stump.

#### HERBICIDE APPLICATION

- The preferred option is that all cut stumps are followed up with herbicide application. However, see "Cutting without chemical application" below.
- Remove any sawdust before applying herbicide.
- Apply herbicide immediately after cutting (i.e. within a couple of minutes).
- The preferred application method is using a herbicide gel product with a brush top that directly applies the herbicide to the cut stump. A pressurised backpack sprayer at very low pressure or a spray bottle can alternatively be used to apply the herbicide mixture.
- Apply herbicide to the cambium layer just inside the bark and the remaining outer bark to the ground line, including the root collar.
- For stems smaller than 8 cm in diameter, treat the entire stump surface. For larger stems, apply herbicide to the outer 20% of the stump. The cambium area next to the bark is the most vital area to cover with herbicide.
- If regrowth occurs, follow up treatment should include any living parts of a treated stump, exposed roots and re-sprouted stems. The areas to be retreated need to be freshly cut before applying herbicide.



#### CUTTING WITHOUT HERBICIDE APPLICATION

If you cannot use herbicide, it is acceptable to use a small axe/hatchet after cutting the stump to remove all branches and needles below the cut. This is not the preferred method of control and should only be used when chemical cannot be applied or is unavailable.

**A1**

GOOD PRACTICE FOR  
WILDING CONIFER CONTROL



**PREVENT  
THE SPREAD**  
National Wilding Conifer Control Programme

**APPENDIX 3**

# GROUND-BASED HERBICIDE INJECTION – ‘DRILL AND FILL’

VERSION 3: OCTOBER 2021

Appendix 2 61

Drill & Fill can be a very cost-effective method where trees have a trunk diameter over 10cm and are accessible to ground crews.

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**Photograph front cover:** Drill and fill method in action, Marlborough Sounds area.  
(Photo source: A. Macalister)

# ABOUT THIS DOCUMENT

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Acknowledgements:	<p>We thank the Department of Conservation, R&amp;D Environmental Ltd, Central Otago Wilding Conifer Control Group, and the National Programme's Technical and Operational Advisory Groups for sharing their knowledge and expertise.</p>
Principal author:	<p>Biosecurity New Zealand (Ministry for Primary Industries)</p>
Document Owner:	<p>Wilding Conifer Programme Manager, Biosecurity New Zealand (Ministry for Primary Industries)</p>
Approved for distribution and use:	<p>Operational Advisory Group, Technical Advisory Group (National Wilding Conifer Control Programme)</p>



Last reviewed:	29 October 2021
Classification / status:	[Version 3]
Document reference:	[Good Practice & Drill and Fill V3 October 21]
Comments and suggestions	Email to: wilding.conifers@mpi.govt.nz

## VERSION CONTROL

Date	Details	Version no.	Amended by
October 2019	Draft finalised and published	Version 1	
July 2020	Additional safety notes for Tordon pasture boss or equivalent (360 G/L Triclopyr amine + 30 G/L aminopyralid).	Version 2	MPI
October 2021	Equipment requirements and safety notes added. High strength glyphosate specified for the control of Pinus pinaster. pH testing required for metsulfuron methyl. Number of holes required for metsulfuron matched to glyphosate. Other minor edits.	Version 3	MPI

### This document should be read in conjunction with:

**WorkSafe** - Working safely with chemicals and fuels on farms

**WorkSafe** - HSNO codes of practice for hazardous substances

NZ Standard for Management of Agrichemicals NZS 8409:2021

Approved Code of Practice for Safety and Health in Forest Operations  
Health and Safety at Work (Hazardous Substances) Regulations 2017

# 1. DRILL AND FILL MATERIALS

## 1.1 EQUIPMENT RECOMMENDATIONS

Below are recommendations for equipment for set-up and delivery.

EQUIPMENT TYPE	RECOMMENDATIONS	IMPORTANT CONSIDERATIONS
<b>Drilling</b>	<ul style="list-style-type: none"> <li>18 V lithium ion drill with a 13–20 mm wood bit or auger and a battery of at least 6Ah.</li> <li>Petrol-powered mechanised drill (fitted with a 20 mm auger bit).</li> </ul>	<p>Petrol-powered drills should not be used in environments where there is a high fire risk, or if being used in such a situation, portable fire extinguishers must be carried. If in steep terrain, consider whether petrol-powered drills can be used safely.</p>
<b>Application</b>	<ul style="list-style-type: none"> <li>A bottle fitted with a nozzle that extends outwards to allow dispensing of the herbicide into the drilled hole. The bottle must have a cap to prevent leakage.</li> </ul>	<p>Bottles must be labelled as 'poison'.</p> <p>Never put hazardous substances in food or drink containers, even if they're labelled. People can get confused about what's in the container and eat or drink the contents by mistake.</p>

<p><b>Application</b></p>	<ul style="list-style-type: none"> <li>• A backpack applicator (to be used where conditions allow)</li> </ul>	<p>When using a backpack applicator, consider whether there is a risk of vegetation catching on the equipment.</p> <p>All application equipment must comply with the Health and Safety at Work (Hazardous Substances) Regulations 2017.</p> <p>All activities must comply with the NZ Standard for the Management of Agrichemicals NZS 8409:2021.</p>
<p><b>Personal Protective Equipment (PPE)</b></p>	<ul style="list-style-type: none"> <li>• Safety glasses (when handling herbicides)</li> <li>• Chemical goggles (when using neat Tordon Pasture boss or equivalent (360 g/L triclopyr amine + 30 g/L aminopyralid)</li> <li>• When handling glyphosate, wear a P2 / N95 fitted mask or respirator with P2 grade filters</li> <li>• Chemical gloves (&gt; 14 mils)</li> <li>• Cotton overalls or long-sleeved shirts and pants (buttoned to the neck and wrist)</li> <li>• Waterproof boots</li> </ul>	<p>Personal Protective Equipment (PPE) must be used in handling, mixing, application and cleaning of herbicides and associated equipment. See the Safety Data Sheet.</p> <p>For National Wilding Conifer Control Programme operations, if the SDS “recommends” or “advises” that a particular type of PPE be used when applying chemical, then this <b>must be used</b>.</p>

<p><b>Other</b></p>	<ul style="list-style-type: none"> <li>• A spill kit with a minimum capacity of 20-litre</li> <li>• A 400g fire extinguisher (in high fire risk areas)</li> <li>• A First Aid kit with saline eye wash must be immediately available for operators</li> <li>• LiPo bags, if portable drills are being used. LiPo bags are made from fire resistant material for safeguarding batteries during charging, transportation and storage to prevent the severity of fire.</li> <li>• pH testing kit when using metsulfuron methyl</li> </ul>	<p>Wherever the fire risk is above 'Low' on the Fire Danger Class System, fire extinguishers must be carried.</p>
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## 2. HERBICIDE CHOICE AND USAGE

### 2.1 TRAINING

General instruction, supervision and training requirements are provided in the Health and Safety at Work (General Risk and Workplace Management) Regulations. The Hazardous Substances Regulations go further to state what a business needs to do to ensure that every worker who uses, handles, manufactures or stores a hazardous substance has the knowledge and practical experience to do so safely.

Employers have a duty to train employees (or make sure someone who is trained supervises them) so they can do their work safely. The Site Lead (or equivalent role as named in the relevant SSSP) for a drill and fill operation must make sure that everyone using chemicals is appropriately trained.

**Note, a GROWSAFE standard certification is needed for any worker using neat Tordon Pasture boss or equivalent (360 g/L triclopyr amine + 30 g/L aminopyralid) or metsulfuron methyl.**

### 2.2 RECOMMENDED HERBICIDE

Before application refer to and follow the directions of the products Safety Material Data Sheet.

	METSULFURON METHYL	HIGH STRENGTH GLYPHOSATE	TRICLOPYR AMINE + AMINOPYRALID
Situation of Use	All wilding conifer species except for <i>Pinus contorta</i> and <i>Pinus pinaster</i> .	For <i>Pinus pinaster</i> .  For all other wilding conifer species, except <i>Pinus contorta</i> , when metsulfuron methyl is not available.	Only for control of <i>Pinus contorta</i> .
Recommended Mixing	50g of Associate or equivalent (600 g/kg metsulfuron-methyl* formulation) per litre of clean water (pH > 7).	Neat product (510 g/L or stronger).	Neat Tordon Pasture Boss or equivalent (360 g/L triclopyr amine + 30 ml/L aminopyralid).

<b>Important information</b>	After mixing, test the pH of the mixture. If the pH is below 7, add Met Enhancer to raise the pH to greater than 7. Add some foam-reducing agent to prevent foam issues when filling drilled holes.	Glyphosate should be dispensed using a drum pump rather than being poured from the drum to avoid spilling/splashing	See safety notes 2.3 below.
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## 2.3 SAFETY NOTES FOR TORDON PASTURE BOSS OR EQUIVALENT

Exposing the eye to Tordon Pasture boss or equivalent can cause serious damage/irritation and in extreme cases, may result in permanent impairment of vision, even blindness.

In the instance of drill and fill, Tordon Pasture boss or equivalent is used neat and there is an increased risk of exposure. As a result, drill and fill operations that involve neat Tordon Pasture boss or equivalent should be carried out by trained and experienced operators with current GROWSAFE standard certificates. The Site Lead (or equivalent role as named in the relevant SSSP) for each drill and fill operation is responsible for ensuring all operators using neat Tordon Pasture boss or equivalent hold this certification.

Care must be taken at all times to protect eyes when handling neat Tordon Pasture boss or equivalent. This means:

- a. bottles or applicators must be stored and carried in a way that minimises the risk of accidental spilling or spurting of chemical, i.e a screw cap should be fitted to the bottle
- b. chemical goggles, sealed goggles or a full face mask must be worn when handling the chemical, and
- c. an eye wash station (portable or in a vehicle) must be immediately available (i.e. no more than 5 minutes away) to the operator using neat Tordon Pasture boss or equivalent at all times.

# 3. DRILL AND FILL METHOD

## 3.1 BEST TIME OF YEAR TO DRILL AND FILL

The best time to drill and fill is during active growing conditions, typically between September and February each year, although this may vary with climate throughout the country.

## 3.2 METHOD

### HOLE NUMBER AND DEPTH

The number of holes drilled depends on the size of diameter at breast height (DBH), herbicide mix used, and the wider surrounds of the tree.

**Table 1:** The recommended number of holes to DBH measurement for different tree species.

SIZE THRESHOLDS DBH (CM)		10	20	25	35	50	80	100
Number of holes to be drilled for each herbicide mix	1. Metsulfuron / glyphosate	1	1	2	3	4	6	8
	2. Triclopyramine + aminopyralid	1	2	2	3	3-6	3-6	3-6

		105	110	120	125	135	140	160
Number of holes to be drilled for each herbicide mix	1. Metsulfuron / glyphosate	8	8	9	10	11	12	13
	2. Triclopyramine + aminopyralid	4-8	4-8	4-8	4-8	4-8	4-8	4-8

### Important considerations:

- On Multi-stem trees, each stem should be treated as a separate tree.
- When the tree to be controlled sits in an open area and is therefore likely to have more foliage, an additional two holes per tree should be added to the recommended number.

### DRILLING

Holes should be drilled at even spaces around the trunk to ensure an even distribution of the chemical throughout the tree. Holes should be drilled into the base of the tree and prominent feeder roots as near to the ground as possible, while still being safe (a comfortable height to work at for long periods).

The holes should be drilled:

- on a downward angle (approx. 45° down), and
- slightly out (30° from the horizontal cross section), and
- to a depth of between 4 cm and 8cm deep (excluding bark) depending on the diameter of the hole and the angle drilled - the hole should be just deep enough to contain 10ml of herbicide. E.g. a hole drilled with a 20mm bit at a 45 degree angle should have a depth of around 7.5 cm.
- lower branches may need to be cut off to gain access to the tree for chemical application. When pre-trimming, take into consideration the steep terrain, the size of the branching and the restriction on cutting above shoulder height.



## HERBICIDE APPLICATION

The hole should be filled with 10mls of the herbicide immediately after drilling. The herbicide should reach up to the cambium layer at the outer edge of the sapwood. When using glyphosate in particular, the hole must be filled to the cambium layer to ensure uptake via phloem. It is not necessary to plug the holes after filling as the hole is drilled at a slight downward angle.

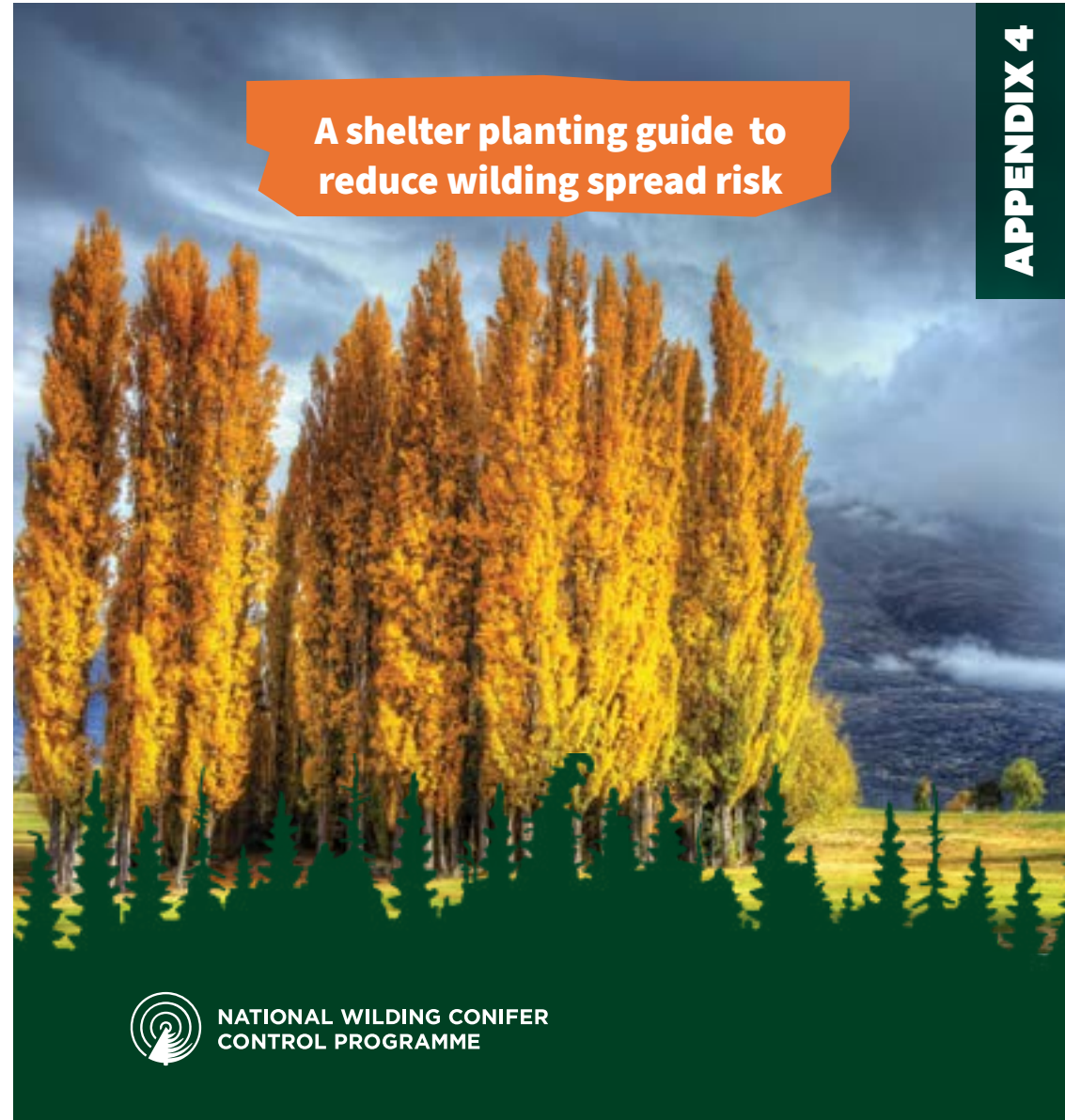
## GPS RECORDING

The location of all trees treated should be recorded as a GPS waypoint so that treated trees can be relocated to accurately assess the success of the control operation.

# The Right Tree for Your Place

**A shelter planting guide to  
reduce wilding spread risk**

**APPENDIX 4**



## WHAT ARE WILDING PINES?

Wilding pines refers to species of conifers including fir, larch and pine trees, that are growing where they are not supposed to be. They pose a big threat to New Zealand's unique environment and primary productions. By selecting non-spreading species for shelter and amenity plantings, you can prevent the spread of wilding pines into surrounding areas.

**The species listed in this guide are for reference only. We suggest speaking with your regional council or local nurseries to determine which trees are most suitable for your area.**

### Plant to reduce wildfire risk

**Please also check Fire and Emergency New Zealand's website for information on how to protect your property from wildfires.**



### Plant locally sourced

**By using ecosourced native plants you will help maintain the area's unique local characteristics. Scan the QR code to learn more.**



**WILDINGPINES.NZ**

**KO TĀTOU THIS IS US**

**🌿 = Evergreen species**

Provides consistent, year-round shelter.

**🌳 = Deciduous species**

Allows more light into paddocks and homestead in winter.

**🇳🇿 = Native species**

Grow naturally in New Zealand and works best as a shelter if planted in mixed species groups.



## HIGH COUNTRY/ELEVATED LAND

### High-Medium Shelter (8 metres +)

#### Suitable for most soil types

**🌿 Leyland cypress 'Ferndown' and 'Staplehill' (sterile hybrids)**

(*Cupressus* × *leylandii*)

Fast-growing tree providing dense, even shelter. Tolerates a range of soils and climates. Cold hardy.

**🌿🌿 Hall's Tōtara (*Podocarpus laetus*)**

Suitable for hedging. Requires protection while young.

**🌿🌿 Kānuka (*Kunzea ericoides*)**

Small tree that is moderately frost tolerant. Good revegetation species that grows well on all soil types except water-logged soils.

**Eucalypts for shelter are recommended to be planted one to two metres apart.**

**🌿 Cider gum (*Eucalyptus gunnii*)**

Large, upright tree that tolerates a range of soils from dry to swampy. Excellent shelter for cold, frosty sites.

**🌿 Swamp peppermint gum (*Eucalyptus rodwayi*)**

Fast-growing, excellent shelter tree. Tolerant of cold, drought, and wet soils.

**🌿 Snow gum (*Eucalyptus pauciflora* subsp.)**

Shelter tree that withstands snow and ice. Grows well in shallow, dry, and rocky through to wet snowy areas on high ridge tops.

**Pines for shelter are recommended to be planted one metre apart. Check regularly for wildings spread.**

**🌿 Radiata hybrid (*x Pinus attenuata*)**

Very reliable shelter over a range of sites. Tolerant of dry and cold conditions. Hardy and thought to be less spread-prone than *P. radiata* in high country.

**🌿 Stone pine (*Pinus pinea*)**

Tolerates hot, dry conditions. Requires well-drained soils. Hardy.

#### Suitable for moister soil

**🌿 Western red cedar (*Thuja plicata*)**

Great for hedging. Good for cool, moist sites; tolerant of full sun and shade. Initial growth is slow.

**🌿 Lombardy poplar (*Populus nigra* 'Italica')**

Fast-growing shelter, but susceptible to rust. Hardy. Can be topped to maintain desired height.

**🌿 Red beech (*Fuscospora fusca*) & silver beech (*Lophozonia menziesii*)**



Survives better when sheltered by a nurse crop.

**🌿🌿 Ribbonwood (*Plagianthus regius*)**



Medium height, hardy tree, can be trimmed into dense hedge. Medium-rapid growth, even on dry, windy sites.

## Medium-Low Shelter (4–8 metres)



### Suitable for drier soil



  **Tarata/Lemonwood** (*Pittosporum eugenioides*)  
& **Kōhūhū/Black Matipo** (*Pittosporum tenuifolium*)

Medium height, good hedging tree. Suitable for privacy screening or lower farm shelter. Tolerates wind, drought, and frost.

  **Mountain lacebark** (*Hoheria spp.*)

Medium height, preferring damp soil in a sunny site. Very cold hardy.


  **Makomako/Wineberry** (*Aristotelia serrata*)  
Divaricating shrub that can be pruned into low shelter. Likes full sun.


  **Kāpuka/Broadleaf** (*Griselinia littoralis*)  
Excellent shelter, suitable for hedging. Tolerates some drought, although grows best with regular irrigation. Trim in summer. Hardy.


## COASTAL AND LOWLAND AREAS

## High-Medium Shelter (8 metres +)


### Suitable for most soil types


 **River she-oak** (*Casuarina cunninghamiana*)  
Tolerates strong winds and will survive both damp and dry conditions. Excellent shelter.



 **Swamp she-oak** (*Casuarina glauca*)  
Tolerates strong and salty winds and will survive both damp and dry conditions. Excellent coastal shelter.



 **Japanese cedar** (*Cryptomeria japonica*)  
Good for shelter and plantations in exposed locations. Relatively tolerant of salt winds and will grow in dry clays.



 **Oven's cypress** (*x Cupressocyparis ovenii*)  
Excellent shelter. Hardy and will withstand windy and dry conditions, except extreme wet soils.

 **Southern mahogany** (*Eucalyptus botryoides*)  
Can withstand salty winds and dry or wet conditions in exposed areas. Good coastal shelter.

 **Monterey cypress** (*Cupressus macrocarpa*)  
Can withstand dry conditions, salt winds and exposed sites. Excellent shelter when tended.



  **Kānuka** (*Kunzeia ericoidies*)  
Small tree that is moderately frost tolerant. Good revegetation species that grows well on all soil types except water-logged soils.



  **Pohutukawa** (*Metrosideros excelsa*)  
Withstands salt winds and dry coastal conditions. Grows well on any well drained soil. Excellent shade and shelter in coastal areas.

  **Tōtara** (*Podocarpus tōtara*)  
Hardy, large to medium tree that can tolerate a range of soil types.





## Medium-Low Shelter (4–8 metres)

  **Karamū** (*Coprosma robusta*)  
Can survive in extreme coastal winds and dry conditions. Their crops of orange berries attract tui and other birds.



  **Cabbage tree** (*Cordyline australis*)  
Very hardy. Can grow well in wet and dry conditions. Well suited to riparian planting.



  **Karaka** (*Corynocarpus laevigatus*)  
Hardy tree surviving salt winds and dry coastal situations. Good for shade and amenity.



  **Kāpuka/Broadleaf** (*Griselinia littoralis*)  
Small tree that grows to 8 meters with bright green, thick, shiny leaves.

  **Ngaio** (*Myoporum laetum*)  
Also known as Mousehole tree. Fast



growing shrub with white flowers. Suitable for drier soil. Toxic to livestock.

  **Matipo** (*Myrsine australis*)  
Easy to grow shrub. Frost tolerant and suitable as a revegetation, hedging and shelter species.

  **Whauwhaupaku/Five Finger** (*Pseudopanax arboreus*)  
Small tree, hardy and can grow in sun to full shade in a range of soils.

  **Kōwhai** (*Sophora spp.*)  
Grows well along river margins and close to the coast. Hardy and can tolerate dry and windy conditions.

  **Akeake** (*Dodonea viscosa*)  
Small tree; can tolerate wet or dry soils.

  **Mānuka** (*Leptospermum scoparium*)  
Grows well on most sites.





# Canterbury wilding conifer rules

Wilding conifers severely alter natural landscapes, and in parts of Canterbury they are the most significant threat to our indigenous biodiversity.

They compete with native plants for sunlight, use up precious water resources and create a fire hazard.

Introduced conifer seeds can be blown several kilometers, quickly leading to new infestations that pose significant costs to production. Prior to the National Wilding Conifer Control Programme it was estimated that wilding conifers were increasing at an additional 90,000 hectares per year. Without intervention, more than 20% of New Zealand could have been covered with wilding conifers within 20 years.

## The Canterbury Regional Pest Management Plan

As part of the National Wilding Conifer Control Programme, Environment Canterbury is working with the Ministry for Primary Industries, landowners and the community to remove wilding conifers from the Canterbury region.

Rules set out in the Canterbury Regional Pest Management Plan explain future land occupier responsibility to manage wilding conifers, pest conifers and pest agent conifers. These rules change depending on different situations.

To consider which control rule applies, and occupiers need to consider:

1. what control operations have been completed
2. how control operations were funded
3. distance to the boundary
4. tree species on the property.

The following scenarios in this document explain who is responsible to manage wilding conifers to prevent re-infestation on the property. Please refer to the glossary at the end of this document for a description of terms used. To view the full Canterbury Regional Pest Management Plan, please visit [ecan.govt.nz/pestmanagement](http://ecan.govt.nz/pestmanagement)

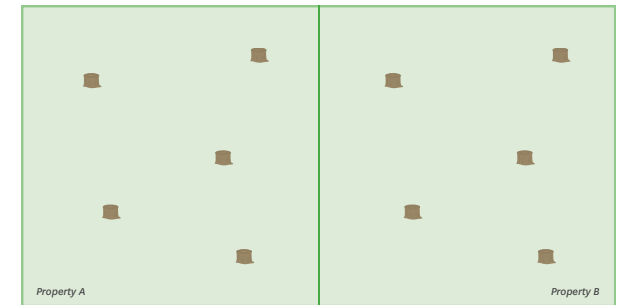
There are different rules for managing wilding conifer forest and plantation forests. For example, all plantation forestry operations are regulated by the National Environment Standard for Plantation Forestry (NES-PF) and are not subject to the Canterbury Regional Pest Management Plan.

### Rule: 6.3.1

#### Scenario

Both Property A and B have had control operations to destroy wilding conifers or pest conifers through publicly funded work (eg the National Wilding Conifer Control Programme) since 1 July 2016.

**Responsibility:** Both Property A and B must destroy all emerging wilding conifers before they reach coning age



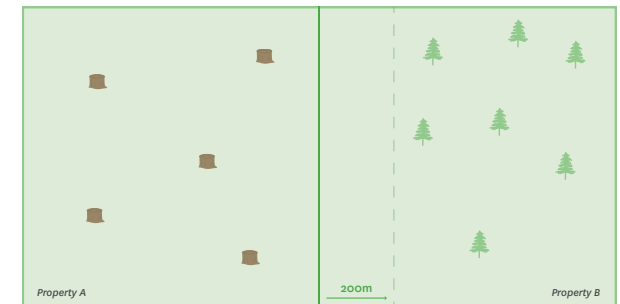
Land occupiers are required to comply with rules 6.3.2 - 6.3.4 on receipt of a written direction from a person authorised under the provisions of the Biosecurity Act 1993.

### Rule: 6.3.2

#### Scenario

**Property A:** has had control operations to destroy wilding conifer and pest conifers since 1 July 2016.

**Property B:** wilding conifer, pest conifer and pest agent conifer do not currently occur within 200m of the property boundary.



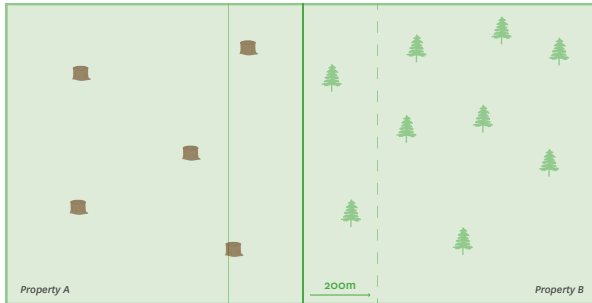
**Responsibility:** The land occupier of **Property B** must destroy wilding conifers, pest agent conifers and pest conifers within 200m of the boundary with Property A (if present) .

### Rule: 6.3.3 – Good neighbour rule

#### Scenario

**Property A:** has had control operations to destroy wilding conifer and pest conifer species since 1 July 2016.

**Property B:** has had no control operations, and has wilding conifers and pest conifer species present within 200m of the property boundary.



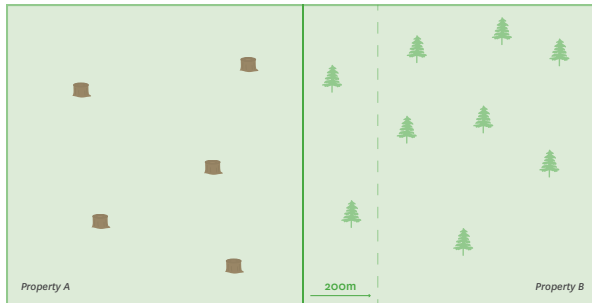
**Responsibility:** The land occupier of **Property B** must destroy wilding conifers and pest conifers (see glossary for full species list) within 200m of the boundary with Property A. Land occupiers must also clear pest agent conifers, where they don't occur as a plantation forest.

### Rule: 6.3.4 – Pest agent

#### Scenario

**Property A:** has had control operations to destroy wilding conifers and planted conifer species through publicly funded work since 1 July 2016.

**Property B:** has had no control operations, and has wilding conifers and pest agent conifers present within 200m of the property boundary.



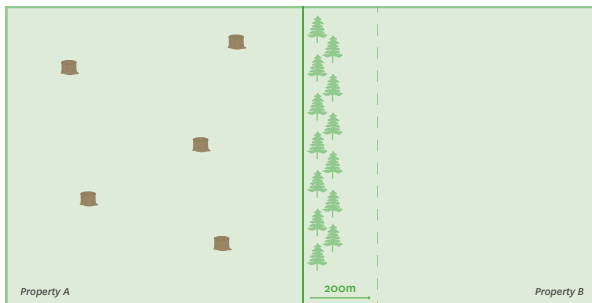
**Responsibility:** The land occupier of **Property B** must destroy wilding conifers and pest conifers within 200m of the boundary with Property A. Pest agent conifers (excluding within a plantation forest) must also be destroyed within 200m of the property boundary.

### Rule: 6.3.4 – Pest agent

#### Scenario

**Property A:** has had control operations to destroy wilding conifers and planted conifer species through publicly funded work since 1 July 2016.

**Property B:** has a shelter belt of pest conifer or pest agent conifer species within 200m of the property boundary.



**Responsibility:** **Property B** must destroy pest conifer or pest agent conifer within 200m of the boundary with Property A.



### Glossary of terms

**Wilding conifers**, also known as wilding pines, are self-seeded and establish naturally. Often their seeds are blown many kilometres by the wind.

Wilding conifers are introduced conifer trees that include, but are not limited to, any of the conifer species listed in the Canterbury Regional Pest Management Plan.

**Pest conifers** are contorta, Corsican, Scots, mountain and dwarf mountain pines and larch, which are all declared pest species in the Canterbury Regional Pest Management Plan. It is illegal to plant these species, and they must be controlled within the rules of the Plan.

Wilding conifers often occur because of seed spread from planted pest conifer species.

**Pest Agent Conifer** refers to any introduced conifer species capable of helping the spread of wilding conifers and is not otherwise specified as a pest in the Canterbury Regional Pest Management Plan and is not located within a plantation forest. These species may aid wilding conifers by creating favourable conditions for growth.

**Plantation forest** refers to a forest deliberately planted for commercial purposes that is covered with at least on hectare of trees that can grow to at least five metres tall at maturity.

**If you have any questions about wilding conifers, please contact our biosecurity team via 0800 324 636 or email [biosecurity@ecan.govt.nz](mailto:biosecurity@ecan.govt.nz)**



**wildingpines.nz**  
**ecan.govt.nz/wildingpine**



**NATIONAL WILDING CONIFER  
CONTROL PROGRAMME**



**Environment  
Canterbury**  
Regional Council  
*Kaunihera Taiao ki Waitaha*