G1 GOOD PRACTICE FOR WILDING CONIFER CONTROL

NATIONAL WILDING CONIFER CONTROL PROGRAMME

GROUND-BASED HERBICIDE INJECTION – 'DRILL AND FILL'

VERSION 3.1: MARCH 2025

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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VERSION CONTROL

Date	Details	Version no.	Amended by
October 2019	Draft finalised and published	Version 1	
July 2020	Additional safety notes for Tordon PastureBoss 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
March 2025	Strength of Tordon PastureBoss (or equivalent) throughout document corrected to: 200 g/L Triclopyr amine + 30 g/L aminopyralid.	Version 3..1	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
Drilling	• 18 V lithium ion drill with a 13–20 mm wood bit or auger and a battery of at least 6Ah. • Petrol-powered mechanised drill (fitted with a 20 mm auger bit).	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.
Application	• 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. • A backpack applicator (to be used where conditions allow)	Bottles must be labelled as 'poison'. 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. When using a backpack applicator, consider whether there is a risk of vegetation catching on the equipment. All application equipment must comply with the Health and Safety at Work (Hazardous Substances) Regulations 2017. All activities must comply with the NZ Standard for the Management of Agrichemicals NZS 8409:2021.
Personal Protective Equipment (PPE)	• Safety glasses (when handling herbicides) • Chemical googles (when using neat Tordon PastureBoss or equivalent (200 g/L triclopyr amine + 30 g/L aminopyralid) • When handling glyphosate, wear a P2 / N95 fitted mask or respirator with P2 grade filters • Chemical gloves (> 14 mils) • Cotton overalls or long-sleeved shirts and pants (buttoned to the neck and wrist) • Waterproof boots	Personal Protective Equipment (PPE) must be used in handling, mixing, application and cleaning of herbicides and associated equipment. See the Safety Data Sheet. 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 **must be used**.

Other	• A spill kit with a minimum capacity of 20-litre • A 400g fire extinguisher (in high fire risk areas) • A First Aid kit with saline eye wash must be immediately available for operators • 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. • pH testing kit when using metsulfuron methyl	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 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 PastureBoss or equivalent (200 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 *Pinus contorta* and *Pinus pinaster*.	For *Pinus pinaster*. For all other wilding conifer species, except *Pinus contorta*, when metsulfuron methyl is not available.	Only for control of *Pinus contorta*.
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 (200 g/L triclopyr amine + 30 g/L aminopyralid).
Important information	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.

2.3 SAFETY NOTES FOR TORDON PASTUREBOSS OR EQUIVALENT

Exposing the eye to Tordon PastureBoss 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 PastureBoss or equivalent is used neat and there is an increased risk of exposure. As a result, drill and fill operations that involve neat Tordon PastureBoss 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 PastureBoss or equivalent hold this certification.

Care must be taken at all times to protect eyes when handling neat Tordon PastureBoss 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 PastureBoss 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	105	110	120	125	135	140	160
Number of holes to be drilled for each herbicide mix	1. Metsulfuron / glyphosate	1	1	2	3	4	6	8	8	8	9	10	11	12	13
	2. Triclopyramine + aminopyralid	1	2	2	3	3-6	3-6	3-6	4-8	4-8	4-8	4-8	4-8	4-8	4-8

Important considerations:

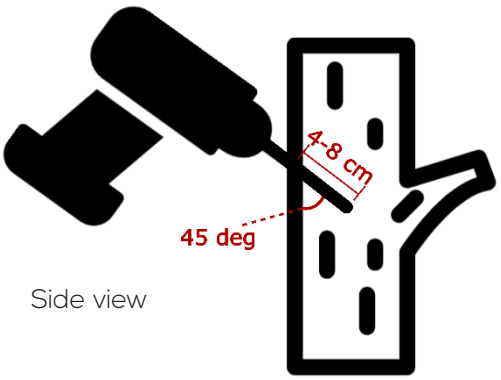
- On Multi-stem trees, each stem should be treated as a separate tree.
- When the tree to be controlled sits in an open area and is therefore likely to have more foliage, an additional two holes per tree should be added to the recommended number.

DRILLING

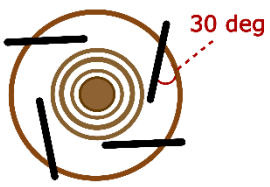
Holes should be drilled at even spaces around the trunk to ensure an even distribution of the chemical throughout the tree. Holes should be drilled into the base of the tree and prominent feeder roots as near to the ground as possible, while still being safe (a comfortable height to work at for long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



Side view



Horizontal / plan view

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.