

HERBICIDE INJECTION OF WILDING CONIFERS

Herbicide injection is widely accepted in New Zealand as an efficient means of killing wilding pines in forest and scrub areas. *Pinus radiata* is the most commonly encountered wilding conifer species in the Marlborough Sounds.

The method is generally preferred over felling as it avoids any land disturbance or damage to surrounding vegetation during control. Whereas a felled tree will break down a lot of native vegetation when it falls, a tree killed standing generally disintegrates gradually over time, causing minimal damage to the surrounding vegetation. This is particularly advantageous when the aim of control is to encourage native forest regeneration.

The method is often considered more acceptable than other chemical control methods, such as spraying, as herbicide injection means all herbicide is contained within the tree, with no discharge into the air, waterways or onto land, and no effects on non-target trees nearby.

However, herbicide injection should not be used on trees that are close to sensitive areas, such as power lines, houses and walking tracks. While the trees tend to disintegrate over time, the occasional treated tree can fall over, and stumps will eventually all fall over, and therefore poses a potential threat to people and structures.

BACKGROUND

Trials as early as 1989 demonstrated that the common agricultural herbicide, metsulfuron-methyl, could be used to kill young *Pinus radiata*, using low doses of herbicide (15g per litre of water).

Department of Conservation trials during the 1990s demonstrated that the common agricultural herbicide, glyphosate, could also kill all size ranges of *Pinus radiata*, but using greater doses of herbicide. Large trees often took two years to die following treatment.

More recently, a series of separate herbicide injection trials have been undertaken in the upper South Island by the Department of Conservation, SCION (the NZ Forest Research Institute), Marlborough Sounds Restoration Trust and Abel Tasman Birdsong Trust to refine herbicide injection approaches.

The trials have sought to develop a method that ensures:

- 100% control is achieved;
- trees die within one year; and
- only a moderate amount of herbicide solution is used.

Reducing the amount of herbicide is beneficial to the environment, reduces costs and makes control more practical, as operators are only required to carry smaller amounts of herbicide solution during control.

TIMING

Herbicide injection is best undertaken during active growing conditions, typically between September and February each year, as this will result in rapid translocation of the herbicide around the tree and swift die-back.

Trees can be treated at other times of the year, but results may be delayed and more variable.

EQUIPMENT

For large operations, a petrol-powered mechanised drill, fitted with a 20mm auger bit, should be used, as it is fast and reliable. Cordless lithium-ion drills have become increasingly suitable in recent years and are an ideal alternative for operations that treat fewer and/or smaller trees. An 18 volt drill with two 4.0 AH (ampere hour) batteries is recommended as the minimum specifications.

Cordless drills should be run with a 15-18mm auger bit.

Herbicide should be dispensed using a 'squirty' bottle fitted with a nozzle. The bottle should not leak and should be able to dispense herbicide accurately. Labelled food containers, such as drink bottles, should not be used to hold the herbicide.

A drench gun is also an effective way to dispense herbicide, but is liable to damage and getting caught up in vegetation.

Operators should wear hearing protection, gloves and overalls as a minimum when undertaking herbicide injection.

METHOD

Holes should be drilled as approximately 40cm spacings around the trunk, or at the following numbers of holes for different diameter trees:

No of holes	1	2	3	4	5	6	7	8	9	10	11	12
Maximum trunk diameter (mm)	125	250	375	500	625	750	875	1000	1125	1250	1375	1500

Holes should be drilled at a convenient height and on a downward angle into the sap wood of the trunk. The hole should be just deep enough to contain 10ml of herbicide – the depth will depend on the diameter of the hole and the angle it is drilled, but 7.5cm deep is a good guide. The hole should be filled immediately after drilling, just so that the herbicide reaches up to the cambium layer at the outside edge of the sap wood.

HERBICIDE SOLUTION

High-strength metsulfuron-methyl (600g/kg) has proven to be entirely effective against all sizes of *Pinus radiata*. A solution of 50g per litre is recommended for large trees, but only 25g per litre is needed for smaller trees.

Metsulfuron-methyl is most soluble in neutral to slightly alkaline water (pH > 7). Therefore, care needs to be taken in selecting a water supply for mixing (e.g.: creek water tends to be more alkaline than rain water) and in choosing a metsulfuron product for use, as some products mixed at the high concentrations recommended here tend to acidify the solution. An acidic solution will be ineffective. For this reason, the Trust recommends Adama Metsulfuron or Agpro Meturon.

If in doubt, an alkaline buffer can be added to increase the pH following mixing. The Trust recommends Agpro Met Enhancer. For large operations, it is recommended that the pH of the water supply and of the mixed solution be tested to ensure that the correct pH range is being achieved. A small amount of foam reducing agent can also be added to the mixed solution to stop foaming.

OTHER SPECIES

Pinus patula (Mexican weeping pine) and *Pinus muricata* (Bishop pine) are occasionally encountered in the Sounds, and for which this method is entirely suited.

Pinus pinaster (maritime pine) is also widely encountered in the Sounds. For this species, use high-strength glyphosate solution (450 - 510g/l) instead. The Trust recommends Adama Polaris.

COST

Treating a 600mm diameter tree costs about 15-20c in herbicide, or 3-4c per hole. A professional operator, costing between \$40 and \$50 an hour and providing their own equipment, can treat between one to 12 large trees an hour, depending on tree locations and access.