# Boffa Miskell

# Waterway Buffer Control Trial

Mid Dome Wilding Conifer Programme Prepared for Mid Dome Wilding Tree Trust

25 July 2023





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### Document Quality Assurance

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# **Executive Summary**

Based on the requirements of the Ministry for Primary Industries (MPI) Aerial Foliar Spray Application (AFSA) good practice guide, there is a requirement to buffer surface water by 50 metres<sup>1</sup> to reduce the impact of herbicide contamination. Mid Dome's mountainous nature contains a vast network of gullies and waterways, resulting in a significant area of residual wilding conifer infestations that cannot be treated via AFSA when this buffer is applied. These waterway buffers are generally very steep surrounded by challenging backcountry terrain. Wilding conifer stem density is typically high with a variable range of tree sizes, including coning trees.

The purpose of this trial was to investigate the feasibility of using ground control techniques to control infestations within the 50 metre waterway buffers left by AFSA operations from the 2021/22 and 2022/23 seasons. A two-hectare site within Five Rivers 2 was selected due to its accessibility and visibility and was therefore considered an ideal location for the trial. Trap and Trigger Ltd undertook the trial during the first week of May 2023.

Control progress was extremely slow and expensive. The per hectare cost of this work was \$13,740 which is significantly higher than any other ground control completed at Mid Dome. The terrain posed significant health and safety risks, and this resulted in some areas being considered too steep and, therefore, avoided within the site. Other contributions to the high cost included the high density of small (1-2m tall) trees within the site and using ground-based herbicide injection ('drill and fill') on all trees within five metres (approximately) of the waterway.

It was concluded that ground control is a hazardous and expensive method of controlling residual wilding conifer infestations within the waterway buffers and is, therefore, considered an unsuitable control method for most waterway buffers at Mid Dome.

<sup>&</sup>lt;sup>1</sup> A 50m buffer at Mid Dome is required by the MPI AFSA good practice guide. Droplet size is a significant factor for spray drift, and the smaller the droplets, the wider the buffer is required by the good practice guide. Based on historic results, the smaller droplet size provided by CP09 nozzles produces superior results for contorta pine at Mid Dome. As a result, a 50m buffer is required when using CP09 nozzles.

# Introduction

The challenge of how to control wilding conifer trees proximate to waterways following AFSA operations is a subject of national importance. Aerial Foliar Spray Application (AFSA) is a wellestablished and cost-effective method of controlling high density wilding conifers. Based on the requirements of MPI's AFSA good practice guide, there is a requirement to buffer surface water by 50m during AFSA operations to mitigate the risk of herbicide contamination. Remaining tree stem density in these buffers is generally high, with significant variation to the age and size of tree, including coning trees. If left untreated, these trees have the potential to undermine control efforts as they remain as a seed source. A desktop analysis shows there is the potential for approximately 518 hectares of waterway buffers that require wilding conifer control in the Mid Dome core management area. While this is yet to be ground-truthed, this shows the potential for significant impact on the Mid Dome programme as trees continue to spread.

There are two approved methods that could be used under the National Wilding Conifer Control Programme (NWCCP) to control trees within waterway buffers<sup>2</sup>. These are:

- 1. Ground control, including:
  - Cut and stump paste using hand tools or chainsaws,
  - Drill and fill
  - Ground basal bark application (GABBA)
- 2. Aerial Basal Bark Application (ABBA)

Both techniques have their own challenges and constraints when it comes to use in waterway buffer areas. These are related to logistics and access, health and safety, and potential water contamination concerns and guidelines. This trial focuses on establishing those factors and constraints for ground control, specifically using cut and stump paste, and drill and fill techniques. ABBA and GABBA are not addressed in this trial.

Alternative herbicides could potentially be explored for use via AFSA within waterway buffers, however only the triclopyr dicamba picloram and aminopyralid herbicide composition (TDPA) is currently approved for the control of *Pinus contorta* under the AFSA good practice guide. The adoption and use of any alternative herbicides would require robust testing before being included in the good practice guide.

Boffa Miskell conducted an operational trial during 1 - 5 May 2023 to better understand the costs and feasibility of controlling wilding conifers within waterway buffers via ground control methods, in Five Rivers 2 Operational Area.

This trial was expected to inform:

- The feasibility of using ground control in this terrain and environment
- The per hectare cost of using ground control
- Any health and safety considerations and the implications of these (i.e., specialist/experienced operator required, number of personnel, any additional personal protective equipment (PPE) or gear needed to perform work safely)

<sup>&</sup>lt;sup>2</sup> Please see https://www.wildingpines.nz/good-practice-guides/ for more details on approved methods.

# Methodology

The trial occurred on a two-hectare area of waterway buffer within the Five Rivers 2 Operational Area and was selected because it is one of the most easily accessible waterway buffer areas available at Mid Dome. The trees surrounding the buffer had been sprayed in the 2021/22 season. The upper areas of the waterway buffer gullies were dominated by small trees and dense infestations. The lower section of the gully contained larger trees.

Trap and Trigger Ltd undertook the trial. This contractor is part of our existing panel of ground contractors working at Mid Dome and had completed a significant amount of work in the 2022/23 season already. They are familiar with the Operational Area and experienced in wilding conifer control. Crew size was five individuals including three experienced and senior team members. Robin Pieper (Boffa Miskell) was onsite on the first day to induct the crew onto the site, review health and safety processes and discuss the approach for the trial.

Contractor instructions were to:

- Fell trees using chainsaws, hand tools and use drill and fill for any larger/complex or dangerous trees that couldn't be felled.
- Drill and fill any wilding conifers within 5m of the waterway or in danger of washing down the waterway after being felled (the 5m guideline may change depending on tree density and terrain).
- Control trees outside of the immediate watercourse and 5m guideline using the most effective method available, generally by using either chainsaws or handsaws (with picloram gel).
- Take site notes, observations, and photos during work.
- Record GPS tracks, hours worked, and resources used for trial site separately to other work being undertaken.



Figure 1: A Trap and Trigger team member looks out over the trial site. Photo: Nick Zaloumis.

# Results

### **Changes to Operations**

- The 5m drill and fill within waterway guideline was amended to 2.5m or one tree length after the first day of control, due to high density of 2-3m trees in the upper section of the waterway buffer.
- To manage fatigue and contractor moral, one day in the middle of the week was spent in another area of easier terrain. The contractor completed three full day's work in the trial area.

### **Contractors Report**

Trap and Trigger updated Boffa Miskell daily by phone on progress of the trial. They also provided a post-operational report, which included details of the factors from the contractor's perspective. They noted that:

- The drill and fill control technique is suited to larger, more easily accessible trunks than those present at the trial site. Tree trunk diameters under 25-30mm are difficult to drill due to a lack of available wood to drill into.
- The variance in tree sizes slowed the work down as it was difficult to choose the most effective control method and operators were constantly changing between drill and fill, chainsaws, and hand tools.
- The terrain was very steep and slowed progress. Some areas could not be accessed due to terrain; most of this site was on the limit for safe working conditions.
- Timing of when ground control is carried out affects the control work efficiency. Ideally, ground contractors would control waterway buffers before AFSA occurs, giving the helicopter pilots a clear line to work towards. Reasons for and against this are discussed in more details in the discussion section.
- Buffers had to be controlled working uphill, as to not fell trees on themselves and trees not yet controlled.
- The trial required experienced operators, both in steep terrain and with the control tools being used. The work was slow, physically difficult, and frustrating at times.

### Health & Safety and Good Practice Compliance

The contractor had one minor incident involving a slip 1-2m down a steep rockface, resulting in a cut to the hand. The contractor held a site meeting to reassess risks and techniques to safely access trees immediately following this incident. This included leaving difficult to reach trees uncontrolled or making more use of hand tool cutting rather than drill and fill.

Trap and Trigger has a robust and reliable health and safety system in place for their work. Robin Pieper completed an audit on the site-specific health and safety plan, PPE, and conducted onsite observations of control activities and found Trap and Trigger to be fully compliant. The drill and fill control technique was also audited, with findings being consistent with the MPI Good Practice Guide. The site-specific safety plan highlighted the increased difficulty of terrain and different control techniques. The contractor followed all standard health and safety procedures, such as toolbox talks and hazard identification, during the trial.

### **Cost Outcomes**

Time and costs were all accurately measured to determine the price to control a hectare of waterway buffer trees. The costs in Table 1 are inclusive of disbursements, herbicide, and site establishment costs.

Table 1. Summary of the costs and area controlled to treat waterway buffer trees (exclusive of GST)

Total cost	Area controlled (ha)	Cost per hectare
\$16,763	1.22	\$13,740

Being a trial site, some time was required to undertake a through site assessment and health and safety induction. However, given the increased risk and difficulty due to terrain, the health and safety induction and extra care was necessary to keep the workers safe.

The full trial site was not completed as works ceased when the maximum budget was reached. Table 1 figures do not include Boffa Miskell's time or costs.

# Discussion

The per hectare cost of the trial is the highest recorded in the Mid Dome wilding conifer control programme, and close to six times more expensive than AFSA operations. In addition to cost, this trial also highlighted some important findings relating to site safety and suitability for ground control, and control techniques and approaches when undertaking this work.

Trap and Trigger are very experienced in wilding conifer control and have an excellent health and safety management system. Trap and Trigger felt that the site was, at times, on the limit of their ability to manage risk. One minor injury was reported during the work.

Contractor moral is also an important factor. This trial took place over four days, however the volume of waterway buffer control work required at Mid Dome may mean that the contractor may be working in similar terrain for many weeks at a time. Comments from the contractor included, "it's hard going" and "frustrating at times". The decision to move to another site in the middle of this trial, and then returning to the trial site, was deemed necessary to avoid significant mistakes due to fatigue or low moral/focus.

Trees on the margin of the 50m buffer also presented extra challenges for ground control following AFSA. Firstly, it is difficult to identify a clear boundary to work towards. This is due to the trees on the outside of the spray blocks receiving an uneven application of herbicide, therefore it becomes unclear if any individual tree on the margin would succumb to the earlier herbicide treatment. This makes it difficult to choose which trees to control and which to leave. Secondly, these 'half-dead' trees are more damaging on equipment due to the hard, dry, and brittle nature of the wood. If ground operators were to move through the waterway buffers ahead of the AFSA operation, this would remove the difficulty of controlling half-sprayed trees and give the ground contractors an opportunity to ground-truth the waterway and create a clear buffer. A clear control line would also aid the helicopter operators when delivering AFSA as it provides pilots with a strong visual boundary to the spray polygons. This approach, however, is unlikely to have a significant positive impact on the per hectare control costs.

Drill and fill was used on all trees within a tree length of the waterway to reduce the risk of trees and slash from being washed into the waterway and causing erosion and/or blockages downstream. However, the small diameter size of the trees also presented challenges due to the inability to drill into the trunk of these trees. This meant that contractors often had to use hand tools on the trees regardless of where the trees were located.

### **Potential impact**

A desktop GIS analysis revealed an estimated 518 hectares of potential waterway buffers exist at Mid Dome, based on the geography and known infestations. This was determined by:

- Using the NZ topographic waterway layer and buffering 50m each side.
- Excluding any waterways within the DOC high value ecological layer where AFSA is prohibited.
- Excluding any waterways on productive pasture.
- Excluding any waterways where there are no dense infestations of wilding conifers.

### **Total Liability**

Using the trial findings of \$13,740 per hectare, it is estimated that the financial liability presented by wilding conifers within waterway buffer areas is \$7,123,325. It should be noted that the Five Rivers Operational Area has easier terrain and better access than many of the waterways in other parts of Mid Dome, therefore this may be an underestimate of the true cost of completing ground control in the waterway buffers. Furthermore, the health and safety liabilities also need to be considered. Given the steep terrain, many parts of the waterway buffers would have to be excluded from ground control due to the considerable health & safety risk to ground based workers.

By comparison, the 2022/2023 AFSA per hectare rate using TDPA was \$2,264 excluding GST, therefore the total cost to control the 518 hectares of waterway buffers using AFSA is estimated at \$1,172,752. This, however, is not feasible as it is unlawful to apply TDPA directly into water, therefore the use of a waterway buffer cannot be avoided.

ABBA control has not been trialled; however, it is considered impractical as a standalone method given the helicopter time cost and volume of herbicide required, which could potentially lead to direct water contamination with triclopyr.

## Conclusion

It is concluded that ground control is an unsuitable method for controlling wilding conifer trees in the waterway buffers at Mid Dome due to the high cost of control and significant health and safety risk exposure. The trial site was considered one of the more easily accessible waterway buffers, therefore it is expected that costs would likely be higher, and safe access even more limited, elsewhere in the Management Unit.

Residual live wilding conifers are likely to significantly undermine the control efforts achieved to date, therefore identifying a safe, cost-effective, and efficacious control method for these waterway buffers will need to remain focus of attention in the short term.

# Appendix One: Maps

Map One: Waterway Buffer Trial Area Map Two: Potential impact of waterway buffers





1:12,500 @ A4 *Projection:* NZGD 2000 New Zealand Transverse Mercator

200 m

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MID DOME WILDING TREES MANAGEMENT Waterway Buffer Trial Site

Date: 25 July 2023

Plan Prepared for Mid Dome Wilding Trees Charitable Trust by Boffa Miskell Limited *Project Manager:* marcus.girvan@boffamiskell.co.nz | *Drawn:* BMc | *Checked:* RPi







MID DOME WILDING TREES MANAGEMENT Potential Waterway Buffer Site

Date: 13 July 2023 | Revision: 0 Prepared for Mid Dome Wilding Trees Charitable Trust Project Manager: Marcus Girvan | Drawn: BMc | Checked: RPi

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