

## Phosphite large tree treatment trials: brief report

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### 1 INTRODUCTION

Forest trials established in 2012, testing phosphite for kauri dieback control, provided promising results with demonstration of a curative effect. But these trials were all carried out with trees in the 'ricker' size class, mostly 15 to 35 cm diameter, with no testing on larger trees. Before any future deployment to treat moderate-sized trees or large iconic trees, and to allow informed decisions to be made, information on safe and effective treatment regimes for large trees is required. Doses based on trunk girth have previously been used to calculate required phosphite volumes. But with giants such as kauri, scaling up from rickers to trees with girths of 5–15 metres may be difficult. Earlier trials also indicated some problems with phytotoxicity, particularly with higher phosphite rates, so it is very important that effects on larger trees are assessed before widespread release of the treatment. A balance must be struck between rates sufficient to suppress the disease, yet still safe for the tree.

In 2016, new trials were established on large kauri trees to help to determine appropriate treatment regimes, with emphasis on phosphite rates and doses lower than those used in previous trials.

### 2 METHODS

#### 2.1 Trial sites and tree selection

Three sites were selected for the trials: Puketotara Rd, near Kerikeri in Northland, Trounson Park in Northland, and the Cascades in the Waitakere Ranges, Auckland. The Puketotara block is on a private land, and Trounson Park and the Cascades are under Department of Conservation and Auckland Council jurisdiction, respectively.

Trees in the trial are in the mature stage. At Puketotara, trees range in size from 0.4 to 1.1 m trunk diameter. At Trounson, trial trees range from 1.0 to 2.1 m trunk diameter, and trees at the Cascades range from 0.6 to 2.4 m diameter. All trial trees showed symptoms of kauri dieback at the start of the trial, including basal trunk lesions.

## 2.2 Treatments

1. Untreated control
2. 4% phosphite trunk injection, 20 mL every 40 cm
3. 4% phosphite trunk injection, 20 mL every 80 cm

Treatments were applied at the Puketotara site in March 2016 and at the Trounson and Cascade sites in November 2016.

The determination of phosphite concentration and doses for the large trees was difficult. With trunk girth being the main determinant of dose and no international experience with treating trees of such size, a very conservative approach was taken. This decision was in part influenced by previous experiences with phytotoxicity. The selected phosphite concentration of 4% with injector frequency of one every 40 cm corresponds to the lowest rate and dose used in the concurrent 'Trunk spray and low rate trial' (Horner 2017 PFR report #15451). We have also included another treatment with an even lower dose of one injector every 80 cm girth. Although this dose may be too low to provide adequate long-term control, we have the opportunity to observe effects over the first year or two, then make another application if deemed appropriate.

## 2.3 Trial design

There are a total of 42 trial trees, (nine at Puketotara, 15 at Trounson and 18 at the Cascades). This is double what was proposed in the initial trial outline, but should lead to more robust data. At each site, trees were divided evenly among the three treatments. To ensure a relatively even distribution of disease symptoms across treatments, at each site trees were placed into groupings based on disease parameters such as lesion activity and canopy symptoms, before randomly assigning the various treatments within each grouping.

## 2.4 Initial assessments

Before treatment, baseline assessments were made on various tree growth and health parameters. These included tree girth, canopy health score, canopy colour, plus trunk lesion size and activity. Selected lesion margins were marked for subsequent measurement of expansion, and canopy photographs were taken for later comparison.

## 2.5 Periodic assessments

Tree health and lesion expansion plus activity will be measured approximately every 6 months. Assessments to date have been in August 2016 for the Puketotara site and February/March 2017 plus August 2017 for all three sites.

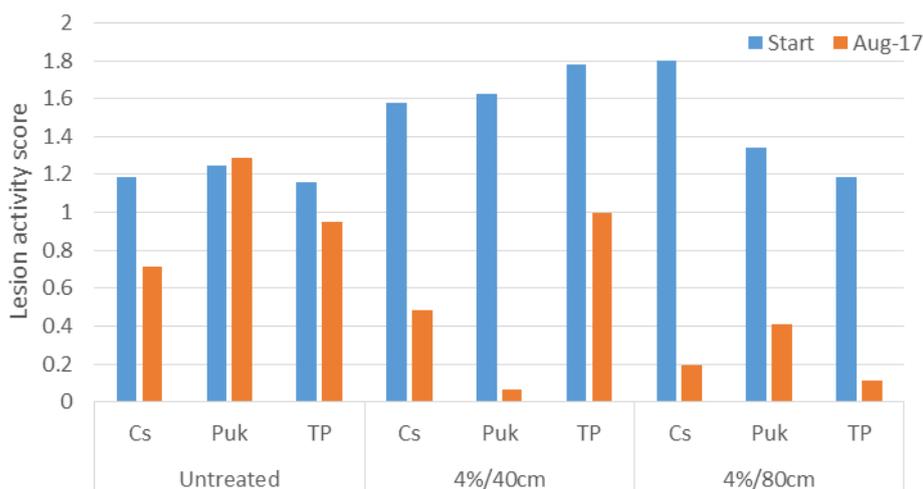
No phytotoxicity symptoms have been observed in any of the trees. There are no major differences in canopy density to date, and no sign of yellowing of leaves.

It is only 9 months since treatments were applied at Trounson and the Cascades, and 17 months since the Puketotara treatment, so it is still too early to draw conclusions about treatment efficacy. There is a trend towards drying up of lesions (less activity) in both of the phosphite regimes, with generally higher lesion activity scores in untreated control trees compared to phosphite-injected trees (Figure 1). However, there are still active lesions in a number of treated trees. If these lesions are still active at the time of assessment in early 2018, a decision will be made about application of a further phosphite dose. This possibility should be discussed with the Planning and Intelligence team.

### 3 PLANS

Six-monthly assessments of tree health, lesion activity and spread, and phytotoxicity symptoms will continue for a period of at least 4 years, with a brief report following each assessment.

Re-application of injection treatments will be considered early in 2018, based on results obtained up to that time. Any required re-application is most likely to be on trees in treatment 3, where injector spacing was 80 cm.



**Figure 1. Lesion activity in *Phytophthora agathidicida*-infected kauri trees on three sites, assessed before treatment with various phosphite applications in March 2016 ('Puk' site) or November 2016 ('Cs' and 'TP' sites). A 4% phosphite solution was applied at one 20-ml injection every 40 cm or one injection every 80 cm around the trunk circumference. Lesion activity scoring: 0=not active, 0.2=probably not active, 0.5=probably active, 1=active, 2=very active.**

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