

POHUTUKAWA PLANTING TRIALS, EASTERN BAY OF PLENTY COAST
ESTABLISHMENT OF TRIALS 2000/2001

INTERIM REPORT

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INTRODUCTION

Early performance of planted pohutukawa (*Metrosideros excelsa*) along the eastern Bay of Plenty coast has been variable with poor survival in many of the planting programmes located on sandy or shingle bays within the Opotiki district. Opotiki District Council and *Forest Research* in collaboration with local communities and iwi established trials on three sites testing a range of treatments to improve the performance of planted pohutukawa along the Eastern Bay of Plenty coast. This project is jointly funded by Project Crimson, Opotiki District Council and Environment BOP. Planting trials have been established over the last three years (1998, 1999, 2000) investigating a range of treatments designed to improve performance. This report briefly describes the treatments and performance of trials established in 1998 and 1999, outlines experimental design and treatments for the trials established 2000 and the early performance of these trials to date.

OBJECTIVES

The objectives of the research were:

- To briefly survey the performance of nursery-raised seedlings of pohutukawa planted on key sites throughout the Opotiki district over the last five years.
- To determine the major factors likely to be affecting the survival and growth of planted pohutukawa seedlings.
- To design and implement joint *Forest Research*, Opotiki District Council and local community planting trials on three sites evaluating a range of planting treatments based on results of the survey.
- To maintain trials and monitor the performance of planted pohutukawa during the establishment phase.
- To produce practical guidelines for managing agencies and local community-based interest groups on establishment of pohutukawa on coastal sites.

TRIAL SITES

Three trials were established on representative areas of each of the main site types identified in the survey (Fig. 1). The sites were:

1. *Ohiwa* - subsoil site derived from volcanic material; slope covered in kikuyu grass (*Pennisetum clandestinum*); adjacent to a camping ground on south side of the Ohiwa Harbour.

2. **Snells Beach** - sand dune site; relatively sheltered backdune site dominated by kikuyu, pohuehue (*Muehlenbechia complexa*) and boxthorn (*Lycium ferocissinum*); within the Opotiki sewage scheme disposal site.
3. **Torere** - shingle beach site; exposed flat beach immediately landward of the foredune in rank exotic grass and patches of pohuehue; western end of Torere Beach.

All sites were either fenced off from grazing animals or were located in areas that were unlikely to be grazed.

METHODS

1998 Planting trials

Three sites were selected and a comprehensive planting trial established in September 1998 aimed at determining major factors likely to be affecting the survival and growth of planted pohutukawa seedlings (*Forest Research* Work Plan 2102).

Treatments were selected on the basis of the results of the survey and early results of *Forest Research* trials with pohutukawa in other regions. Treatments were:

- **Fertiliser** - a slow-release NPK fertiliser was applied to selected plants at time of planting at all sites. This involved placing a Growtab pellet beside the root ball approximately half way down the planting pit. There were unfertilised plants as controls.
- **Added material** - three types of material (subsoil, compost, mulch) was added as separate treatments to selected seedlings at time of planting at the sandy and shingle sites. This involved removal of the sand or shingle from an enlarged planting pit and placing at least two shovel-fulls of subsoil or compost into the pit to surround the root ball. The mulch treatment involved placing hay around the base of planted seedlings after planting.
- **Irrigation** - at the sandy and shingle sites, selected seedlings were watered once weekly during a 2 month dry period which occurred approximately 3 months after planting.

Treatment combinations are given in Appendix 1 for the 1998 plantings at Ohiwa.

1999 planting trials

On 9th August 1999, a field-based meeting between representatives of Project Crimson, Carter Holt Harvey, Environment Bay of Plenty, local community groups, Opotiki District Council and *Forest Research* was held at Opotiki. Several initiatives were discussed at this meeting and further trials were established in September/October 1999 incorporating some of these ideas aimed at increasing survival and growth of pohutukawa on sandy and shingle sites.

A second series of trials established in September/October 1999 investigated the following treatments:

- Comparison of planted topped seedlings vs non-topped seedlings (Snells Beach and Torere). Previous planting trials indicate that many seedlings suffer dieback of tops so removal of up to 50% of the top was tested to reduce transpiration losses after transplanting.
- Comparison of seedlings raised in small containers vs large containers (Snells Beach and Torere).
- Use of 20 litre buckets (with bases removed) to shelter individual trees planted with deep mulch and slow-release fertiliser applied at planting vs non-sheltered seedlings (Snells Beach and Torere sites). Plantings in the Auckland area indicate increased success using buckets as shelters.
- Planting of pohutukawa amongst naturally regenerating pohuehue on raised sand dune mounds vs planting on lower lying frost-prone sites (Snells Beach).

- A small pilot trial involving planting small seedlings on rotting driftwood to mimic natural processes (Torere).

Treatment combinations for 1999 plantings are given in Appendix 2 for Snells Beach and Torere.

2000 planting trials

Planting trials were established on three sites in September 2000 in the Opotiki District at Torere Beach, Hawaii Beach and Snells Beach building on the success of planting trials over the last two years and refining of treatments.

Torere

- Objective - to compare growth of large and small seedlings planted on shingle sites with and without rotting driftwood.
- Planted 7th September 2000
- Five replicates of four planted groups
 - Five pohutukawa seedlings raised in PB3 polythene planter bags planted in shingle
 - Five pohutukawa seedlings raised in PB3 polythene planter bags planted in rotting driftwood
 - Small seedlings ex seed trays planted in shingle
 - Small seedlings ex seed trays planted in rotting driftwood.
- For driftwood plots, PB3 seedlings planted amongst deep mulch of rotting wood; for plots of seedlings from trays, seedlings pricked into fine mulch of rotting driftwood with some protection provided by surround of large driftwood pieces.
- For shingle plots, PB3 seedlings planted with no/minimal clearing of exotic grass cover; small seedlings from trays planted into site where exotic grass cover scraped off by spade and some cultivation with some shelter afforded by large driftwood pieces placed around each plot.
- 50x25 mm treated wooden numbered pegs centrally located in each plot 15-20 cm aboveground.
- All PB3 seedlings planted with 2 Growtabs.
- Hay mulch placed around PB3 seedlings on shingle sites only
- 25-50 seedlings planted in small groups or as separate seedling from trays within approximately 50 cm diameter plot around the central peg for each plot; approximate numbers of seedlings per plot recorded for each plot.
- Seedlings planted were:
 - PB3 seedlings – average 35 cm high, range 18-48 cm.
 - Seedlings ex seed trays – average 5 cm high, range 2-7.5 cm.
- Planting treatments given in Table 1 and layout of trial for Torere given in Figure 1.

Hawaii

- Objective - to compare growth of large and small seedlings planted on shingle sites with and without rotting driftwood.
- Planted 7th September 2000
- Five replicates of two planted groups
 - Small seedlings ex seed trays planted in shingle
 - Small seedlings ex seed trays planted in rotting driftwood.
- Driftwood plots comprise rotting wood broken into fine mulch for planting of seedlings.
- Shingle plots prepared by scraping exotic grass cover off site before planting with minor cultivation; some shelter afforded by adjacent large driftwood pieces placed around each plot.

- 50x25 mm treated wooden numbered pegs centrally located in each plot 15-20 cm above ground.
- 25-50 seedlings planted in small groups or as separate seedling from trays planted in 0.5 m diameter plot around the central peg for each plot; approximate numbers of seedlings per plot recorded for each plot.
- Seedlings planted were:
 - PB3 seedlings – average 35 cm high, range 18-48 cm.
 - Seedlings ex seed trays – average 5 cm high, range 2-7.5 cm.
- Planting treatment given in Table 2 and layout of trial for Hawaii given in Figure 2.

Snells Beach

- Objective – to plant further groups of seedlings on mounds above frost level.
- Three groups of five seedlings each planted.
- Wooden pegs centrally located in each plot 60-70 cm aboveground.
- All PB3 seedlings planted with 2 Growtabs.
- Hay mulch placed around PB3 seedlings on shingle sites only
- Seedlings were PB3 seedlings – average 35 cm high, range 24-44 cm.

Pilot provenance trial

Pohutukawa raised as seedlings at the Naturally Native NZ Plants Ltd nursery for several years have shown considerable variation both between and within seedlots. Several rows of pohutukawa planted for up to three years at the nursery site at Whakatane also indicated a wide range of leaf forms, crown morphologies and growth rates. Similar differences had also been observed in field plantings both within and between different seed collections.

A pilot provenance trial was established at the Naturally Native NZ Plant nursery near Whakatane. The aim was to compare growth and form of four different eastern Bay of Plenty provenances of pohutukawa to quantify any genetic differences for at least three years.

The four local provenances planted were:

1. Torere
2. Ohiwa
3. Opape
4. Waiotahi

Sixteen trees of four provenances (total of 64 trees) were planted on a uniform site adjacent to main nursery complex at the Naturally Native nursery on 27 September 2000. Trees were planted in four rows with each row marked with a treated wooden 50 mm x 25 mm wooden peg. One seedling from each provenance was randomly allocated to each four-tree replicate as shown in Figure 3.

EARLY PERFORMANCE

Results for the first year performance for the 1998 trials are detailed in Bergin & Houghton (1999). In brief, survival and growth of pohutukawa planted on the sand dune site (Snells Beach) and the shingle beach site (Torere) were very poor compared to performance on subsoil derived from volcanic ash (Ohiwa). Second year growth of seedlings planted at Ohiwa on volcanic material was good with seedlings approaching 1 m in height.

Interim results from trials established in 1999 are detailed in Bergin & Houghton (2000). In contrast to the 1998 plantings, there was high survival in of the trial established on the shingle substrate at Torere although there was little growth of plants. Seedlings planted in the

shelter of buckets with bases removed performed poorly and there was no difference between topped and non-topped seedlings. However there was good survival and growth of small seedlings transplanted from trays into rotting driftwood.

Inspection of trials established in 2000 at the shingle beach of Torere indicate good survival of large potted seedlings planted amongst driftwood as well as for the second planting of small seedlings transplanted from seed trays to within rotting driftwood.

REFERENCE

Bergin, D.O.; Houghton, M. 1999: First year performance of planted pohutukawa, eastern Bay of Plenty coast. *Forest Research* report (Unpubl.). 13p.

Bergin, D.O.; Houghton, M. 2000: Performance of pohutukawa planting trials, eastern Bay of Plenty coast. *Forest Research* report (Unpubl.). 12p.

Table 1: Planting treatments for seedlings planted at Torere, September 2000.

Replicate	Plot No.	Seedling type	Planting Treatment
1	1	PB3	Shingle
1	2	PB3	Driftwood
1	3	Tray	Driftwood
1	4	Tray	Shingle
2	5	PB3	Shingle
2	6	PB3	Driftwood
2	7	Tray	Driftwood
2	8	Tray	Shingle
3	9	PB3	Driftwood
3	10	PB3	Shingle
3	11	Tray	Shingle
3	12	Tray	Driftwood
4	13	PB3	Shingle
4	14	PB3	Driftwood
4	15	Tray	Shingle
4	16	Tray	Driftwood
5	17	PB3	Shingle
5	18	PB3	Driftwood
5	19	Tray	Driftwood
5	20	Tray	Shingle

Table 2: Planting treatments for seedlings planted at Hawaii, September 2000.

Replicate	Plot No.	Seedling type	Planting Treatment
1	1	Tray	Shingle
1	2	Tray	Driftwood
2	3	Tray	Shingle
2	4	Tray	Driftwood
3	5	Tray	Shingle
3	6	Tray	Driftwood
4	7	Tray	Shingle
4	8	Tray	Driftwood
5	9	Tray	Shingle
5	10	Tray	Driftwood

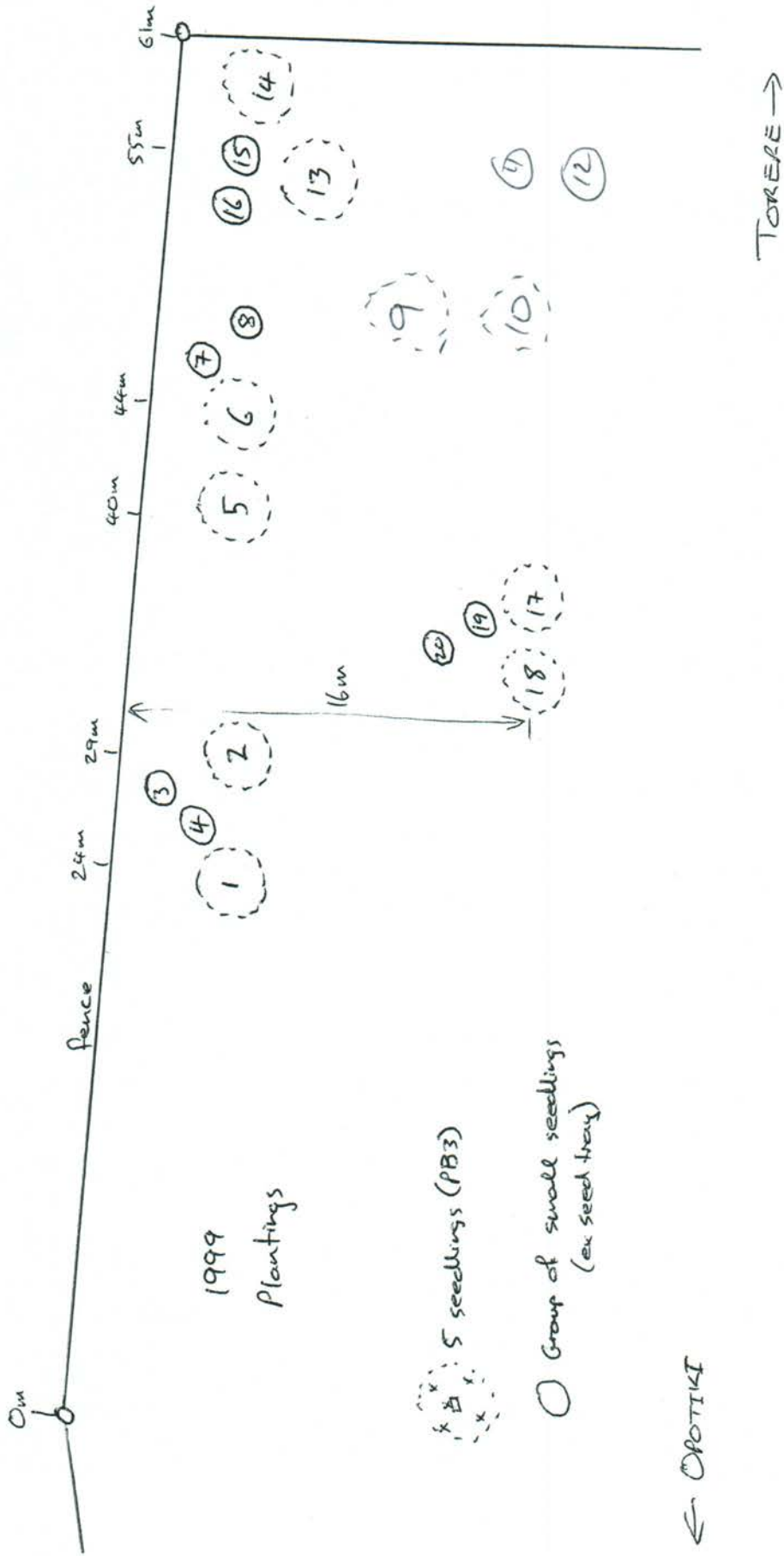


Figure 1: Layout of pohutukawa planting trial, Torere, established September 2000. Large plots are seedlings raised in PB3 planter bags small plots are groups of small seedlings from seed trays.

- SEA -

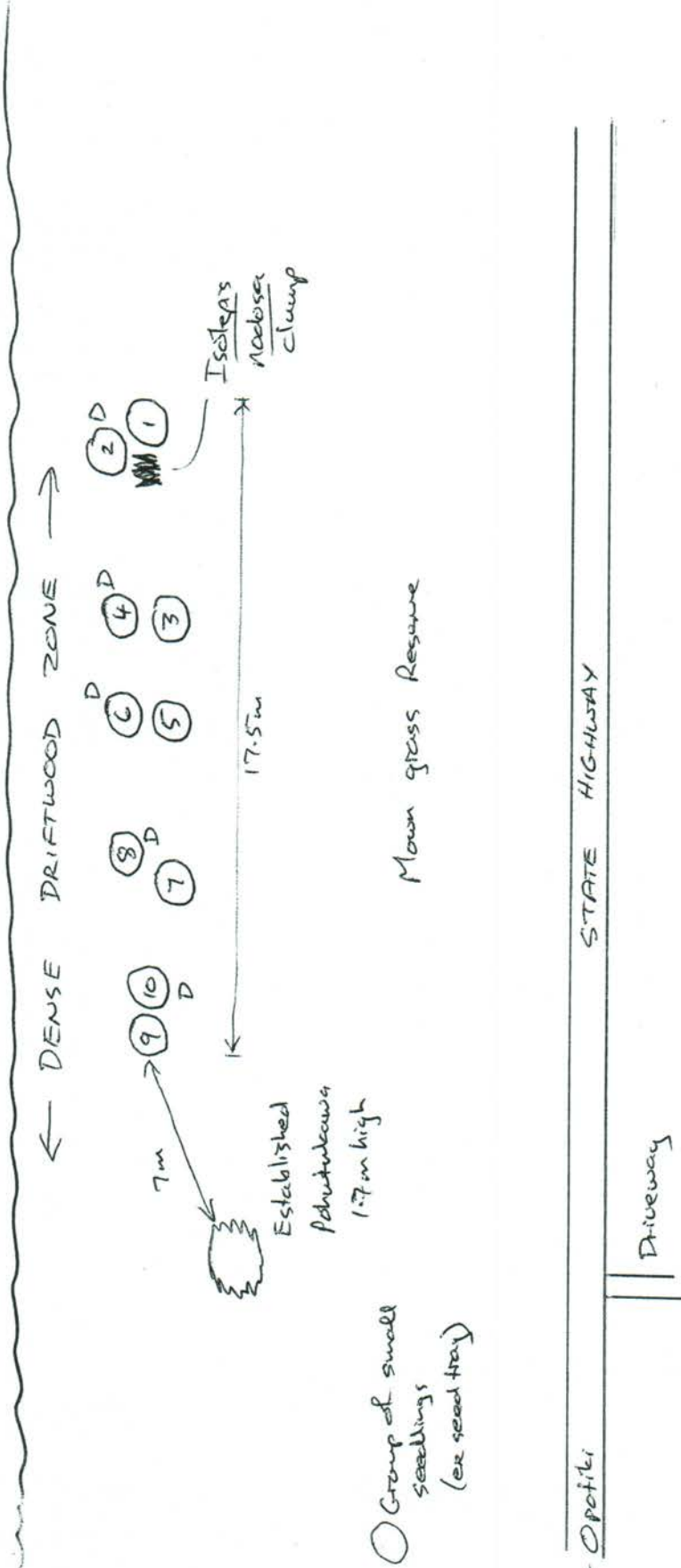


Figure 2: Layout of small pohutukawa seedlings from seed trays planted at Hawaii, September 2000.

1	3	3	2
4	2	4	1
2	1	3	4
4	3	2	1
1	2	4	2
3	4	1	3
2	1	4	1
3	4	2	3
1	3	3	1
2	4	2	4
2	4	4	1
3	1	3	2
3	4	1	2
1	2	3	4
2	1	1	2
4	3	3	4
Row 4	Row 3	Row 2	Row 1

Provenance codes:

- 1 = Torere
- 2 = Ohiwa
- 3 = Opape
- 4 = Waiotahi

Figure 3: Layout of pohutukawa provenance trial established in September 2000 at Naturally Native NZ Plants nursery, Whakatane.