

ESTABLISHMENT OF AN INDIGENOUS COASTAL
PLANT COMMUNITY PLOT TRIAL
WHIRTOA BEACH, COROMANDEL

D. O. Bergin
New Zealand Forest Research Institute, Rotorua

and

H. Spence
Environment Waikato, Hamilton



NEW ZEALAND
FOREST RESEARCH INSTITUTE
LIMITED

ESTABLISHMENT OF AN INDIGENOUS COASTAL PLANT
COMMUNITY PILOT TRIAL, WHIRITOA BEACH, COROMANDEL

D. O. Bergin
New Zealand Forest Research Institute, Rotorua

and

H. Spence
Environment Waikato, Hamilton

1994

ABSTRACT

An indigenous plant community trial was established at the south end of Whiritoa Beach in collaboration with Te Koha O Rapa Tio Tio Trust. A wide range of indigenous coastal plant species were planted with the aim of providing information on revegetation of dunelands using a plant community approach.

The trial comprises a total of 132 plots involving the planting of a range of species including lowland indigenous trees and shrubs, and the indigenous sand binding species, spinifex and pingao. Various fertiliser treatments have been superimposed and several propagation treatments for spinifex tested. Results will be used to extend trials to further sites and eventually to produce guidelines for revegetation of sand dunes.

KEYWORDS: sand dunes, Coromandel Peninsula, revegetation, indigenous species, fertilisers.

INTRODUCTION

The New Zealand Forest Research Institute (NZ FRI) duneland research programme, evaluating the role that indigenous species have in stabilising coastal dunes, has concentrated on the two major indigenous sand binders, pingao (*Desmoschoenus spiralis*) and spinifex (*Spinifex sericeus*). Although considerable progress has been made with determining appropriate revegetation techniques using these species (Bergin & Herbert 1994) the focus is now on a more holistic approach to habitat management and research of coastal dunes and vegetation. This involves targeting a full range of indigenous species that make up the local dune plant community rather than single-species management.

A comprehensive indigenous plant community trial was established in early September 1994 by NZ FRI and Environment Waikato in collaboration with Te Koha O Rapa Tio Tio Trust. With assistance from the Trust, a wide range of indigenous coastal plant species were planted with the long-term aim of providing information on revegetation of dunelands using a plant community approach.

OBJECTIVES

- To evaluate seedling establishment and growth of selected coastal tree and shrub species planted on sand dunes.
- To evaluate the performance of planted trees and shrubs within natural woody ground cover vegetation and on exposed foredune sites.
- To evaluate a range of revegetation techniques for establishing pingao and spinifex on foredunes.
- To determine the effect of a range of fertiliser options at and after planting.
- To provide sand dune owners, managers and the community with guidelines for establishment of trees and shrubs on dunes and revegetation on foredunes using spinifex and pingao.
- To produce guidelines for the local Maori Trust to enable the establishment of a stand of pingao for traditional weaving including guidelines for sustainable harvesting of the resource.

SITE DESCRIPTION

The trial was located at the south end of Whiritoa Beach, Coromandel Peninsula (Fig. 1). Permission was given by Kanea Huia-Le-Thaby and her whanau (Nga Kaitiaki O Te Urupa) of the Te Koha O Rapa Tio Tio Trust to use part of a Urupa (sacred Maori ancestral burial ground) and an adjacent beach surrounding a disused sand extraction area for the trial.

The Urupa of approximately 1.2 ha comprises mainly back dune and a foredune along the seaward margin. The back dune is covered in a dense ground cover dominated by pohuehue (*Muehlenbeckia complex*) with sand coprosma (*Coprosma repens*) prominent in some areas. There are also scattered patches and single specimens of lowland tree and shrub species that are regenerating naturally on the site. These include karo (*Pittosporum crassifolium*), taupata (*Coprosma repens*), houpara (*Pseudopanax lessonii*) and kawakawa (*Macropiper excelsum*).

The foredune is an approximately 150 m long by 5-10 m wide strip of mobile sand running the full length of the Urupa with a gentle slope at the south end sparsely vegetated with natural spinifex. At the Moray Street end of the Urupa, the foredune is steep and mostly unvegetated. The Urupa is fenced off along the landward margin with a 1.8 m high post and wire fence to discourage entry by beach users into the burial ground.

Along the inland margin of the old sand mining site, a curved beach extends from the Urupa for about 200 m south to the Trust's proposed camping area. The gently sloping beach is mostly bare sand with very sparse spinifex and sand convolvulus (*Calystegia soldanella*) with the indigenous sedges *Isolepis nodosa* and *Carex pumila* on lower lying flat sites. One plant of the rare indigenous sand binder, *Austrofestuca littoralis* also occurs here.

TRIAL TREATMENTS AND DESIGN

The trial comprised a total of 132 plots with one of several establishment treatments assigned to each plot using a randomised complete block design. The trial comprises two major components: planting of woody species on the backdunes and foredune, and establishment of sand binding species on foredunes. The trial was established 5-7 September 1994. The trial layout is shown in Figure 2.

The first component involved the planting of several lowland indigenous tree and shrub species in 10 blocks of 8 plots each. All plots consisted of a centrally located numbered peg with seedlings planted within 1.5 m of the peg. Treatments were:

1. Sites — half the plots established in gaps cut in the pohuehue ground cover on the Urupa and the remainder on the adjacent exposed foredune. Gaps cut using a motorised scrub bar and vegetation removed from the gap by fork leaving a 1.5 x 1.5 m gap.
2. Species — pohutukawa (*Metrosideros excelsa*) and houpara planted in six tree plots (3 of each species). One each of taupata, karo, puriri (*Vitex lucens*) and tawapou (*Planchonella nova-zelandica*) planted in 4 tree plots. Seedlings ex *Terra Firma Nursery*, Taupo. Pohutukawa, taupata and karo raised in PB3 polythene bags ranging in height from 50-70 cm. Some pohutukawa had been frosted recently and trimmed at the nursery. Taupata and karo robust seedlings with well developed root systems. Houpara, puriri and tawapou raised in Hillsons root trainers ranging in height from 30-50 cm; these species generally small, not hardened off and root systems that did not always fully occupy containers; puriri in particular very soft and small.
3. Fertiliser — approximately 30 g of Magamp (small handful) applied to each seedling incorporated into the sand at planting.

Appendix 1 lists the site, species and fertiliser treatments applied to each tree and shrub species plot.

The second component involved the establishment of 32 plots of spinifex seed, runners and seedlings, and the planting of 20 plots of pingao seedlings on the beach adjacent to the old sand extraction site. Plots consisted of a 3 m diameter circle in which treatments were applied and identified by a central numbered wooden peg with 60 cm of each peg left above ground to monitor any changes in sand levels. Treatments were:

1. Spinifex seedlings — eight 2-year-old nursery-raised seedlings planted in each appropriate plot; seedlings ex NZ FRI nursery.
2. Spinifex seed — using the NSW seed sowing method, a handful of seed (4-6 spikes or seedheads) was placed into 150 mm deep holes dug by spade. Each 3 m diameter plot had 20 holes placed approximately 50 cm apart.

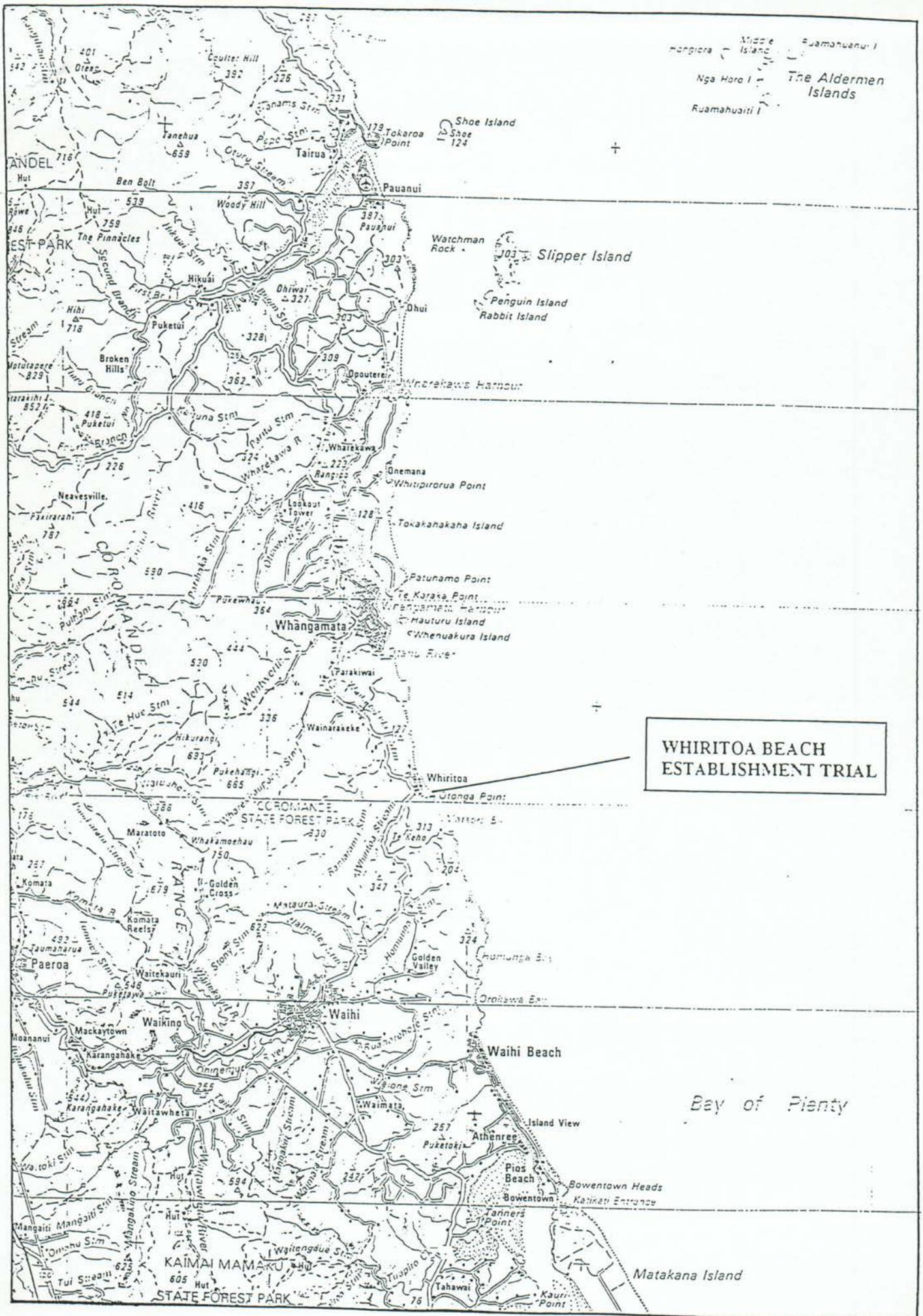


FIGURE 1: Location of the indigenous coastal plant community trial, Whiritoa Beach, Coromandel.

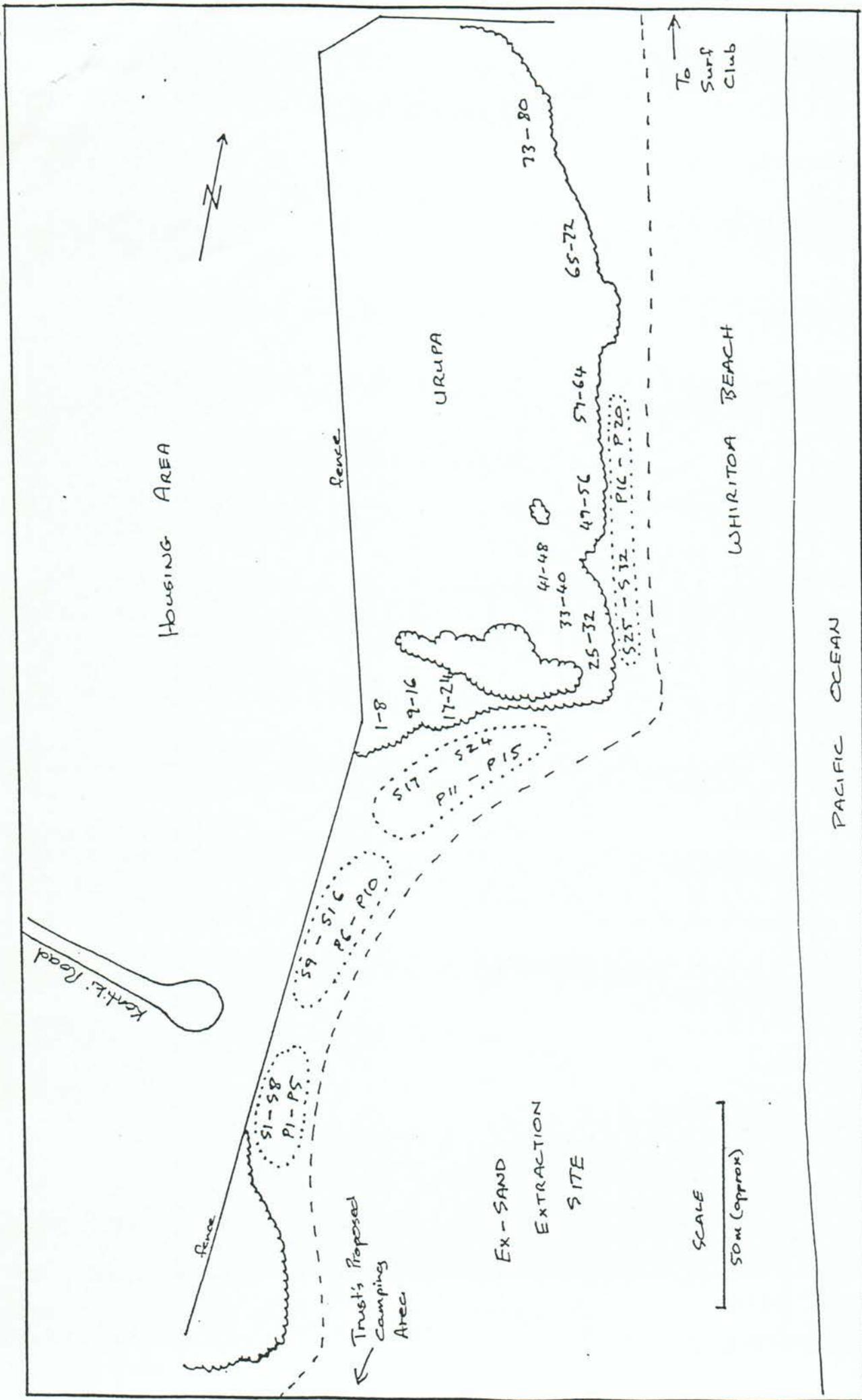


FIGURE 2: Trial layout for the indigenous coastal plant community trial, Whiritoa Beach, Coromandel. The approximate position of plots are indicated by blocks for trees and shrubs (10 blocks with plot numbers 1-80), spinifex (4 blocks with plot numbers S1-S32), and pingao (4 blocks with plot numbers P1-P20). Refer to Appendix 1-3 for treatment combinations assigned to each plot.

3. Runners — runner tips up to 1.0 m long collected from established colonies along Whiritoa Beach placed into 100-150 mm deep trenches with 75 mm of tips left exposed. Five runners placed in parallel trenches dug within each plot. As with a previous pilot trial (Bergin and Herbert 1994) large numbers of runners were difficult to find and most were brown and brittle. Transplanting of runners likely to be better in autumn.
4. Fertilisers — the range of treatments include:
 - apply Magamp at planting incorporated with sand
 - broadcast fast-release N fertiliser at germination (6-8 weeks after germination)
 - broadcast fast-release N fertiliser several months after planting
 - broadcast fast-release N fertiliser at germination and several months after planting.
5. Pingao seedlings — planting of 20 seedlings per plot with seedlings spaced approximately 50 cm apart. Eighteen-month-old seedlings up to 30 cm raised in Hillsons root trainers ex *Terra Firma Nursery*, Taupo.

Treatment combinations for spinifex are given in Appendix 2 and for pingao in Appendix 3.

MONITORING

Tree and shrubs were measured for heights and early mortality 4 weeks after planting. All treatments were inspected approximately 8 weeks after establishment to record germination of spinifex and apply fertilisers to appropriate plots.

The trial will be assessed for performance at the end of the first growing season (approximately 6 months after establishment) and further fertiliser treatments applied where planned. Results will be used to extend plantings on this site and to establish trials on further sites and eventually to produce guidelines for revegetation of sand dunes where an indigenous species plant community approach is preferred.

ACKNOWLEDGMENTS

The New Zealand Forest Research Institute and Environment Waikato are grateful to the Te Koha O Rapa Tio Tio Trust, and in particular Kanea Huia-Le-Thaby and her whanau (Nga Kaitiaki O Te Urupa) for permission to use the Urupa and adjacent sand dunes for establishing the trial. Gaps were cut by Whiti Huiateroa and Karl Watkins (Taskforce Green Programme). The Assistant Manager for the Trust, Mark Snow (Waihi Training centre Salvation Army Training and Employment Programme), as well as Bobby Snow assisted with the establishment of the trial. Mark Kimberley (NZ FRI) designed trial layout.

Establishing the planting trial on the Urupa is consistent with plantings carried out by the Trust aimed at ongoing protection of the Urupa and prevention of further erosion.

Tena koutou e te whanau o Te Koha O Rapa Tio Tio me nga kaitiaki mo o koutou tautoko ki a matau tena koutou tena koutou tena koutou katoa.

REFERENCES

- Bergin, D. O. and Herbert, J. W. 1993. Spinifex establishment trial, Whiritoa — performance of first season's growth. New Zealand Forest Research Institute Project Record No. 4020 (Unpubl.). 9 p.
- Bergin, D. O. and Herbert, J. W. 1994. Restoration of native plant communities on sand dunes in New Zealand. *In* Proceedings of the Fourth Annual New South Wales Coastal Management Conference, October 1994, Gosford, Australia. 8 p.

APPENDIX 1: Treatment combinations for trees and shrubs planted in the indigenous coastal plant community trial, Whiritoa Beach. Sites: exposed - plots located on open sand along foredune; shelter site - plots located within woody ground cover. Species: trees - 3 trees each of pohutukawa and houpara (coastal five finger); other - 1 each of taupata, karo, puriri and tawapou. Fertiliser applied at planting was slow-release Magamp.

Plot No.	Block	Site	Species	Fertiliser
1	1	exposed	trees	no
2	1	shelter	trees	no
3	1	exposed	trees	yes
4	1	exposed	other	yes
5	1	shelter	other	no
6	1	shelter	trees	yes
7	1	exposed	other	no
8	1	shelter	other	yes
9	2	exposed	trees	yes
10	2	exposed	trees	no
11	2	shelter	trees	yes
12	2	exposed	other	no
13	2	shelter	trees	no
14	2	exposed	other	yes
15	2	shelter	other	yes
16	2	shelter	other	no
17	3	exposed	trees	yes
18	3	shelter	other	no
19	3	exposed	trees	no
20	3	exposed	other	yes
21	3	exposed	other	no
22	3	shelter	trees	yes
23	3	shelter	other	yes
24	3	shelter	trees	no
25	4	exposed	other	yes
26	4	exposed	trees	no
27	4	shelter	trees	yes
28	4	exposed	other	no
29	4	shelter	trees	no
30	4	exposed	trees	yes
31	4	shelter	other	yes
32	4	shelter	other	no
33	5	shelter	trees	no
34	5	exposed	trees	no
35	5	exposed	other	no
36	5	exposed	trees	yes
37	5	exposed	other	yes
38	5	shelter	other	yes
39	5	shelter	trees	yes
40	5	shelter	other	no

APPENDIX 1 (cont'd)

Plot No.	Block	Site	Species	Fertiliser
41	6	exposed	trees	yes
42	6	shelter	other	yes
43	6	exposed	other	no
44	6	exposed	trees	no
45	6	exposed	trees	yes
46	6	shelter	trees	no
47	6	exposed	other	yes
48	6	shelter	other	no
<hr/>				
49	7	exposed	other	no
50	7	exposed	trees	yes
51	7	shelter	other	yes
52	7	exposed	trees	no
53	7	shelter	trees	no
54	7	exposed	other	yes
55	7	shelter	trees	yes
56	7	shelter	other	no
<hr/>				
57	8	shelter	other	no
58	8	shelter	trees	yes
59	8	exposed	other	no
60	8	exposed	trees	no
61	8	shelter	trees	no
62	8	exposed	other	yes
63	8	exposed	trees	yes
64	8	shelter	other	yes
<hr/>				
65	9	shelter	trees	yes
66	9	exposed	trees	no
67	9	exposed	other	no
68	9	shelter	other	yes
69	9	exposed	trees	yes
70	9	shelter	trees	no
71	9	shelter	other	no
72	9	exposed	other	yes
<hr/>				
73	10	shelter	other	no
74	10	exposed	other	no
75	10	shelter	trees	yes
76	10	shelter	other	yes
77	10	shelter	trees	no
78	10	exposed	trees	no
79	10	exposed	other	yes
80	10	exposed	trees	yes