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JULY-DECEMBER 1994 PROGRESS REPORT ON OBJECTIVE 1 OF THE SAND DUNE REVEGETATION PROGRAMME

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## ABSTRACT\*

The 1994 assessments planned for ten spaced-plant trials on open sand dunes have been completed and growth data are being processed.

Survival was still very variable both within and between species. After 3 years three species had either a mean survival rate exceeding 50% or had covered more than 50% of the experimental plot area. These were *Acacia sophorae* at Ninety-mile Beach; *Acacia saligna* and *A. sophorae* at Kawhia; *Teline stenopetala* at Harakeke. Under a different set of experimental conditions at Santoft Beach, none of the species planted in 1991 showed either 50% survival or 50% cover.

In a more recent trial, the most persistent species after 2.5 years at Santoft Beach were *Casuarina glauca* (86%), *Medicago arborea* (78%) and *Acacia saligna* (70%).

After 1.5 years' growth in directly-comparable trials, best survival was noted for *Lotus tenuis* (79%), *Acacia sophorae* (65%) and *Dorycnium hirsutum* (60%) at Ninety-mile Beach; *Lotus pedunculatus* (99%), *L. corniculatus* (98%) and *Lathyrus latifolius* (93%) at Muriwai Beach; and *Lotus pedunculatus* (100%), *L. corniculatus* (100%) and *Dorycnium hirsutum* (97%) at Santoft Beach.

Potting compost used as a medium for raising plants showed no statistically-significant advantage over local sand in terms of survival rate after 18 months in three species at Ninety-mile Beach.

\* Note: This material is unpublished and must not be cited as a literature reference.

# JULY -DECEMBER 1994 PROGRESS REPORT ON OBJECTIVE 1 OF THE SAND DUNE REVEGETATION PROGRAMME

## INTRODUCTION

During the first three years of the Sand Dune Revegetation Research Project, which is funded by the Foundation for Research, Science and Technology, ten spaced-plant trials were established in five major sand dune areas on the west coast of the North Island. These trials are located in areas of marram grass and/or spinifex, just behind the foredune. They are designed to test the relative potential of a number of selected nitrogen-fixing plants to act as replacements for *Lupinus arboreus* in the sand dune environment. Descriptions of trial layout and earlier assessments of plant performance have been reported by Gadgil and Sandberg (1992a; 1992b); Lowe (1992); Gadgil, Douglas, Sandberg and Lowe (1993), Gadgil, Douglas, Knowles, Lowe, and Sandberg (1994). Table 1 gives a summary of trial details and experimental layout.

This report documents progress made in Objective 1 of the Sand Dune Revegetation Programme (CO4301) during the first half of the 1994 -95 funding year. The Objective covers both trial work and technology transfer.

### 1. SPACED PLANT TRIALS

Between mid-October and mid-December 1994, maximum height and maximum spread of all surviving plants were recorded where individuals could be identified, and stem diameter of woody species was measured at ground level. Where vegetative spread precluded the identification of individuals, the proportion of the experimental plot covered by the planted species was recorded and plant height was measured (maximum height plus height at 9 randomly-selected points). Plant vigour was assessed and one individual (or the area originally allocated to an individual plant) in each replicated group of species was selected at random for destructive harvesting so that above-ground dry matter production and nitrogenase activity in the roots could be determined. All field and laboratory work associated with the 1994 assessment of these trials has been completed and data processing is in progress.

The only results to hand at this stage are those for plant survival, or for ground cover where individual plants could not be identified (Tables 2 and 3). Direct comparisons are valid within the FR 165 and FR 193 trial series, and between Santoft Trials A and B (see Table 1). After three years' field growth in fenced trials in local sand, the three most persistent species at each site were:-

Ninety-mile Beach: *Acacia sophorae* (54% cover), *Acacia saligna* (11% survival),

*Chamaecytisus palmensis* (4% survival).

Kawhia: *Acacia saligna* (90% cover), *Acacia sophorae* (88% cover), *Lotus pedunculatus* (28% cover).

Harakeke: *Teline stenopetala* (53% cover), *Chamaecytisus palmensis* (33% survival), *Acacia saligna* (12% survival).

Survival after 3 years in unfenced sites at Santoft rarely exceeded 20% and was very variable (N.B. *Acacia* spp. and *Teline* were not tested in these trials).

In the fenced Santoft C trial where plants had been raised and planted in potting compost in Autumn, survival after 2.5 years was highest in *Casuarina glauca* (86%), *Medicago arborea* (78%) and *Acacia saligna* (70%). *Casuarina* had been included even though it is not known to nodulate in New Zealand and probably does not fix nitrogen.

Only *Acacia sophorae*, *Dorycnium hirsutum* and *Lotus tenuis* showed more than 50% survival after 1.5 years at Ninety-mile Beach in the FR 193 trial series. At Muriwai Beach and Santoft Beach, 10 and 15 species respectively had persisted to this level, suggesting that latitude and its effect on climate was a factor in determining the relative success of the planted species.

## 2. TECHNOLOGY TRANSFER

An account of the early work on this project was published during the current funding year ( Douglas *et al.*, 1994).

Several enquiries have been received from interested landowners and from the Auckland Regional Council. Copies of the Parliamentary Report and the latest NZFRI Project Records have been distributed where appropriate.

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TABLE 2 - Relative survival rate in spaced-plant trials, November 1994 (mean percentage of original number planted with standard deviation in brackets. 'Cover' indicates that individual plants could not be distinguished - see Table 3. 'P.mix' = seedlings planted in potting compost.)

Time since planting	TRIAL LOCATION													
	Ninety-mile Beach			Muriwai Beach			Kawhia		Harakeke		Santoft Beach			
	FR 165/01	FR 193/01	FR 193/02	FR 193/03	FR 165/02	FR 165/03	FR 165/02	FR 165/03	A	B	C	FR 193/04		
<i>Acacia saligna</i>	3yr 11(13) Cover	1.5yr 27(30) 65(40)	1.5yr P.mix 98 (4) Sand 98 (4)	1.5yr 46(26) 44(22)	3yr Cover Cover	3yr 12(5) Cover			3yr	3yr	2.5yr	1.5yr		
<i>Acacia sophorae</i>		6(7)		35(37)				17(29)	21(19)	70(47) 86(17)	70(21) 68(20)	63(35) 94(12)		
<i>Astragalus cicer</i>		4(6)		63(22)				0	0			54(31)		
<i>Casuarina glauca</i>		13(15) 0		22(19) 44(40)						17(27) 8(17) 8(11)		61(29) 58(43) 55(33)		
<i>Chamaecytisus palmensis</i> 3211/3218						33(12)								
'Waikari' AL 3820														
'Carvossa C 3573														
PMC 3552														
AL 3570	4(5)		P.mix 3(6) Sand 1(3)		1(2)									
<i>Dorycnium hirsutum</i>		60(28)		87(11)				0	13(13)	31(38)		97(6)		
<i>Dorycnium pentaphyllum</i>		10(17)		72(23)						3(6)		85(20)		
<i>Dorycnium rectum</i>		35(28)		78(29)						25(29)		85(20)		
<i>Hedysarum coronarium</i>		26(35)		35(24)					0	14(21)		71(33)		
<i>Hippophae rhamnoides</i>										0				
<i>Lathyrus japonicus</i>	0							4(8)	0	50(58)		91(15)		
<i>Lathyrus latifolius</i>	0	43(32)		93(8)	1(2)	2(3)		0	25(43) 21(36)					
<i>Lathyrus tuberosus</i>				17(12)	0							0		
<i>Lespedeza cuneata</i>	0	12(26)		98(4)	0							100		
<i>Lotus corniculatus</i>	0	43(13)		99(3)	Cover	Cover		4(8)		36(44)		100		
<i>Lotus pedunculatus</i>	Cover		P.mix 74(12) Sand 57(27)											
<i>Lotus tenuis</i>		79(23)		88(17)				0	0	58(50)		94(15)		
<i>Lupinus arboreus</i>								4(8)	21(36)					
<i>Lupinus nootkatensis</i>	0	0		0	0	0						2(6)		
<i>Medicago arborea</i>		5(6)		30(28)						78(18)		44(30)		
<i>Robinia pseudoacacia</i>										22(38)				
<i>Sutherlandia frutescens</i>	0	0		14(25)	0	2(3)				0		25(21)		
<i>Telindea stenopetala</i>	1(2)	6(9)		87(20)	0	Cover						50(42)		
<i>Trifolium ambiguum</i>	0	0		56(26)	5(5)	Cover						31(31)		
<i>Vicia gigantea</i>														
<i>Vicia sepium</i>								0	0	0				

TABLE 3 - 1994 survival assessments in the FR 165 trial series for treatments (species) in which individual plants could not be identified (mean percentage of 3x3m plot covered, with standard deviation in brackets. 'IPD' indicates that data for individual plants appear in Table 2.)

	FR 165/1 Ninety-mile Beach	FR 165/2 Kawhia	FR 165/3 Harakeke
<i>Acacia saligna</i>	IPD	90(4)	IPD
<i>Acacia sophorae</i>	54(43)	88(25)	6(12)
<i>Lotus pedunculatus</i>	9(12)	28(13)	10(5)
<i>Teline stenopetala</i>	IPD	IPD	53(50)
<i>Trifolium ambiguum</i>	IPD	IPD	3(3)