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REVEGETATION OF SAND DUNES CONTRACT

AUTHOR(S): D. O. BERGIN & J. W. HERBERT

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KEYWORDS: SAND DUNES, FERTILISER, INDIGENOUS, SPINIFEX SERICEUS,
DESMOSCHOENUS SPIRALIS**ABSTRACT***

As part of the main thrust of this programme to find a nitrogen-fixing species to replace lupin (Objectives 1 & 3), Objective 2 also evaluates the role that indigenous plants could have in stabilising dunes. This interim report covers progress to end to the 1993/94 financial year for work agreed to with the Foundation for Science and Technology for Objective 2 evaluating the two principle indigenous sand binding species for rehabilitation of dunes, spinifex (*Spinifex sericeus*) and pingao (*Desmoschoenus spiralis*). All targets for 1993/94 have been completed in full.

Two sand dunes sites, Matarangi Beach and Whiritoa Beach, were selected for monitoring of natural plant communities and associated dune dynamics. Transects were located at each site along a relatively uniform section of each beach and a point-sampling frame used to determine vegetation composition, abundance and distribution within each plot. A baseline dataset was established in October 1993 at both sites and transects were remeasured in February 1994. Monitoring will continue for several years to give long-term trends in the vegetation community and in relation to any changes in dune morphology.

Spinifex and pingao seed was collected and sown into pots as part of a glasshouse fertiliser pot trial. Fertiliser treatments including unfertilised controls have been determined as a first step to investigate comparative nutritional requirements of these species.

Duneland revegetation options and the NZ FRI duneland research programme has been discussed with several groups and agencies. NZ FRI are co-organising a workshop planned for late 1994 to focus on appropriate directions for duneland management and research and the importance of effective technology transfer.

* Note: This material is unpublished and must not be cited as a literature reference.

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INTERIM REPORT ON OBJECTIVE 2, REVEGETATION OF SAND DUNES CONTRACT

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INTRODUCTION

It has been recognised since the beginning of this century that human interference with natural sand dune vegetation had caused a widespread problem of wind erosion and sand drift across productive land. The most successful measures in combating induced erosion have involved the rapid replacement of a continuous and permanent vegetation cover to protect the sand from wind action. The goal of this programme, prompted originally by the demise of yellow tree lupin (*Lupinus arboreus*) during the mid-1980's and the effect this has on the vigour of marram (*Ammophila arenaria*) -dominated dunes, is to define the best methods for establishing a continuous, persistent and vigorous vegetation cover on coastal sand dunes.

As part of the main thrust of this programme to find a nitrogen-fixing species to replace lupin (Objectives 1 & 3), Objective 2 also evaluates the role that indigenous plants could have in stabilising dunes. The intention is not replace marram grass and exotic N-fixing plants for use in all erosion-prone areas, but to provide managers with options where indigenous plant communities would be preferred for cultural, historical, environmental or social reasons. This interim report covers progress to end to the 1993/94 financial year for work agreed to with the Foundation for Science and Technology for Objective 2 evaluating the two principle indigenous sand binding species for rehabilitation of dunes, spinifex (*Spinifex sericeus*) and pingao (*Desmoschoenus spiralis*).

1993/94 TARGETS FOR OBJECTIVE 2

Investigate the potential of indigenous sand-binding plants for sustainable management of erosion-prone dunelands in areas where use of indigenous species can either complement marram planting or are environmentally or culturally appropriate.

- Determine the optimum habitat for indigenous sand-binding plant species, including spinifex and pingao, by initiating a monitoring programme of natural communities and associated dune dynamics on one site; investigate the interaction of spinifex, pingao and marram, and implications for duneland revegetation.
- Initiate glasshouse pot trials to determine the major nutritional requirements of pingao and spinifex so that fertiliser applications are cost effective and efficient.
- Discuss and promote duneland revegetation options with at least three community groups and kaitiaki.

Produce an interim report for the NZ FRI CEO.

METHODS

Dune plant community dynamics

Two sand dunes sites, Matarangi Beach and Whiritoa Beach, both of which are located on the eastern coast of the Coromandel Peninsula, were selected for monitoring of plant communities and dune dynamics. Transects were located at each site along a relatively uniform section of each beach and a custom-made point-sampling frame used to determine vegetation composition, abundance and distribution within each plot.

Nine semi-permanent transects were established (one per plot) at Matarangi Beach and 4 transects at Whiritoa Beach with each transect running from mean high-water mark to back dune where sand binding vegetation ceased. The point-sampling frame was positioned at varying intervals along each transect (up to 10 sampling frame stations per transect) and 20 spring-loaded needles depressed at each station. The first intercept of each needle was recorded by species where vegetation occurred. The location of each sampling station in relation to foredune, dune slack and a back dune, and including any other dune features, was also recorded.

Pot fertiliser trials

Spinifex seed (ex Matarangi Beach) and pingao seed (ex Whangamata Beach) was collected in January-March 1994 and seed viability assessed using seed cutting tests on samples. Beach sand with slow release fertiliser (Magamp, medium granule) was placed into 150 10x10 cm pots. For spinifex, approximately 2000 sound seed was separated from spikes (seedheads) and 25 seed sown at 2 cm spacing in each of 75 pots. For pingao, the volume of seed and debris containing at least 25 viable seed was determined. This standard volume (container 3 cm diameter x 2.5 cm height) of seed was then broadcast sown onto each of a further 75 pots. Pots were then placed in a glasshouse.

Fertiliser treatments including unfertilised controls have been determined as a first step to investigate comparative nutritional requirements of major dune species. Earlier nutritional studies on dune species in Australia have been reviewed to assist with trial design and treatments (Barr & McDonald 1977a; 1977b). Fertilisers to be tested in the current trial include a comparison of fertilisers readily available in New Zealand (Urea, DAP, superphosphate & Magamp) as well as Nitram which is widely used in Australian sand dune revegetation programmes. Fertiliser treatments will be based on nutrient content or each fertiliser to allow direct comparisons. Treatments will be applied to seedlings 4 weeks after germination. Shoots and leaves will be harvested within 6 months of fertiliser application to determine relative differences in biomass between treatments.

INTERIM RESULTS

All targets for 1993/94 have been completed in full.

Dune plant community dynamics

The two sites selected have different sand dune morphology and vegetation communities. The Matarangi Beach is part of a 4 km long sand spit immediately south of the Whangapoua Harbour and is characterised by a wide flat dune system typical of spit formations. In contrast, Whiritoa Beach is exposed ocean beach that is exposed to easterly storms and large waves, resulting in a steep sandy beach and a relatively steep sided foredune. Subdivision and associated development of most of the Whiritoa shore has reduced the width of the natural dune system.

A baseline dataset was established in October 1993 at both Matarangi and Whiritoa Beaches and transects were remeasured in February 1994. Approximately 2600 points were sampled at the two sites during each assessment. Baseline data is yet to be analysed. Although the dune vegetation at both beaches is dominated by spinifex, there is a greater range of species, particularly weeds, at Matarangi than at Whiritoa. With only a spring and a summer assessment to date, there appears to be considerable seasonal variation in the abundance and vigour of some of the common indigenous and exotic dune species. Monitoring will continue for several years to give long-term trends in the vegetation community and in relation to any changes in dune morphology.

Fertiliser pot trials

Germination and early growth is currently being monitored for spinifex and pingao sowings in pots before application of fertiliser treatments as planned.

Technology transfer

Duneland revegetation options and the NZ FRI duneland research programme has been discussed with the following groups and agencies:

- Mercury Bay Community College, Whitianga (Sept 1993)
- Dune Care Community Group, Whiritoa Beach, Coromandel (Oct 1993)
- Matarangi Beach Estates, Matarangi Beach, Coromandel (Nov 1993)
- Hauraki District Council, Whiritoa Beach (Jan 1994)
- Dune Care Community Group, Port Waikato (April 1994)
- Department of Conservation staff - Waikato, Bay of Plenty and East Coast Conservancies; Science Directorate

NZ FRI are co-organising with Environment Waikato a sand dune workshop for late 1994 for invited participants representing a range of sand dune interest groups including Regional and District Councils, the Department of Conservation, Dune Care Community groups, the Maori community and sand dune forest owners. The aim of the workshop is to focus on appropriate directions for duneland management and research and the importance of effective technology transfer.

REFERENCES

- Barr, D. A. ; McDonald, T. J. 1977a: The effect of fertiliser on the growth of sand spinifex grass (*Spinifex hirsutus*). Beach Protection Authority of Queensland Report No. D 01.3. 14-21.
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