COASTAL DUNE VEGETATION NETWORK

PROCEEDINGS OF THE COASTAL DUNE VEGETATION NETWORK 2006 CONFERENCE INVERCARGILL

'Coastal management - the Southern Way'

compiled by

Greg Steward, Bala Tikkisetty and Robin Pagan

environment SOUTHLAND

Parks *administration*

'Coastal management - the Southern Way'

Proceedings of the
Coastal Dune Vegetation Network Conference
1-3 March, 2006, Invercargill

Compiled by

Greg Steward
Ensis-Environment, Rotorua

Bala Tikkisetty
Environment Southland, Invercargill

Robin Pagan
Invercargill City Council, Invercargill

February 2006

Coastal Dune Vegetation Network
Private Bag 3020
Rotorua

SPONSORING OGANISATIONS

The Coastal Dune Vegetation Network would like to acknowledge and thank the following organisations who have sponsored this 9th Conference of the Coastal Dune Vegetation Network

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Environment Southland

Invercargill city council
"CITY OF WATER AND LIGHT"

Invercargill City Council

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CONTENTS Page

COASTAL DUNE VEGETATION NETWORK MISSION STATEMENT

To provide a forum for the free exchange of information on sustainable management of coastal dune ecosystems with emphasis on the use of vegetation to restore natural character, form and function.

NETWORK OBJECTIVES

The objectives of the Network are:

1. To provide direct funding support, from Financial Members, for prioritised research projects.

2. To provide leverage through Members contributions to attract Public Good Science Funds and optimise returns to the Coastal Dune Vegetation Network.

3. To respond to coastal resource managers and user-sourced research priorities through a process of mutual prioritisation in consultation with collaborators.

4. To provide high quality, timely, research-based information and management outcomes to Coastal Dune Vegetation Network membership through field trips, meetings, workshops, and by other appropriate means.

PROGRAMME

Venue: Victoria Rooms, Civic Centre, Invercargill

WEDNESDAY, 1st March 2006

8.30 am	Display set up & registrations	Reception committee
9.00 am	Karakia / Blessing the Conference	Michael Skerrett Kaupapa Taiao Manager, Murihiku
9.10 am	Welcome address	Stuart Collie Chairman, Environment Southland (ES) **Session Chair: Robin Pagan, Invercargill City Council**
9.20 am	**Key note address** "Coastal issues in the New Zealand Environment"	Laurel Tierney Chair, Fiordland Marine Guardians
9.50 am	Morning Tea	
10.15 am 10.25 am	CDVN – welcome and highlights Introduction to Southern Coasts and National Roundup *A quick regional roundup, non-stop slide show and power point map presentation* National roundup from Financial Members of CDVN	Harley Spence, Chairperson, CDVN Elizabeth Miller, Ensis David Bergin, Ensis Southland – Jane Kitson, ES Stewart Island – Eamonn Ganley, Doc Codfish Island – David Blair Catlins – Fergus Sutherland Dunedin – Mark Ross, DCC Otago – Stephen Swabey, ORC
12.00 pm	Lunch break	

THURSDAY, 2nd March 2006

	Technical Session III ***Estuary Management***	**Session Chair:** **Environment Southland**
8.30 am	Estuary monitoring and management - Regional perspective	Michelle White, Environment Southland
8.50 am	- National perspective	Leigh Stevens, Cawthron Institute
9.10 am	*Spartina* management	Graeme Miller, Department of Conservation
9.30 am	Tea / Coffee break	
	Technical Session IV ***Threats in Coastal areas***	**Session Chair: Cr Brian Mason, Environment Southland**
10.00 am	Coastal sub-divisions	Bruce Halligan, Southland District Council
10.20 am	Coastal erosion	Dallas Bradley, Environment Southland
10.40 am	Southern storms and dune ecology	Dr Mike Hilton, Otago University
11.00 am	Marram grass eradication programme – Rakiura National Park	Eamonn Ganley, Department of Conservation
11.20 am	An example of coastal erosion management by a Southland Community	Lyle Mason, South Catlins Coastal Landcare Group
11.40 am	Getting ready for the field trip	
	Field Trip I	
12.00 noon	Buses depart for Fortrose, Otara and Waipapa point	Packed lunch
6.00 pm	Arrive at Victoria Rooms, Invercargill	

COASTAL DUNE VEGETATION NETWORK HIGHLIGHTS 2005-2006

Elizabeth Miller and David Bergin
Ensis, Rotorua
March 2006

Since the last conference, considerable time has been spent seeking an alternative structure for the Network so that it can independently seek further funding opportunities. Progress has been reported at the Annual General Meeting.

Research

Exposed site trials

- The final report on the Oakura dune reshaping and planting trials undertaken with New Plymouth District Council has been completed. A poster was on display at the NZ Coastal Society Conference at Tutukaka last October.

- Observations of pilot plantings of spinifex along the Christchurch coast show a good build-up of sand at the toe of the foredune. Although the very successfully established spinifex foredunes at Taylors Mistake are producing seed, relatively low numbers of seeds are viable. This has caused difficulties in raising large numbers of spinifex from locally-sourced seed.

Backdune trials

- A trial of native backdune species has been established at Ohiwa Beach in the eastern Bay of Plenty, with generous in-kind support from local community groups and councils. Performance of twelve tree, shrub and grass species will be assessed. Plants were produced in two different container types, and are in either exposed or more sheltered sites.
- Data from long-term backdune trials at Whitianga and Awhitu Peninsula has been analysed for reporting.

Technical Bulletins

Two new CDVN Technical Bulletins are in the final stages of preparation, and we expect them to be available within the next few months. Most of the funding for their preparation and production has been from the DoC Biodiversity Advice Fund. They are:

"Marram grass – friend or foe"

Marram grass has been used to stabilise coastal sand in New Zealand, and in many other countries, for over a century. Today, native sand-binding plants are often preferred for foredune revegetation. This Bulletin describes the characteristics of marram grass and includes guidelines for assessing whether or not it is an appropriate component of the vegetation cover in specific sand dune site types.

"Measuring Success – guidelines for management of revegetation programmes"

Communities and local authorities have accumulated different amounts of local experience in revegetation of coastal sand dunes. Many would welcome suggestions about the planning of planting programmes and assessing the effectiveness of each operation. This Bulletin offers suggestions from research experience on ways to make the best use of scarce resources and the voluntary time and effort on which most projects depend.

Coastal Dune Vegetation Network Conference 2006

"Coastal Management - the Southern Way"

Key note address
presented by

Laurel Teirney
Fiordland Marine Guardian

The Guardians' Fiordland Marine Initiative: a unique journey

From a blank sheet in 1995, to implementing a new Act ten years later, the Guardians of Fiordland's Fisheries and Marine Environment have undertaken a unique journey in the interests of looking after the Fiordland marine environment and those who value and use it. An enthusiastic representative group endowed with first hand knowledge, experience and a passion for the Fiordland marine environment, have been through a process of developing an integrated management strategy for Fiordland's marine environment with support from the agencies, saw the Fiordland Marine Management Act enacted in 2005 by the agencies and the Government and are now taking part in implementing the management package with the agencies.

How it all began

A variety of groups that valued and were involved directly in the Fiordland marine environment came together to share views about those values and how they might be looked after into the future. Participants included Te Runanga o Oraka/Aparima and Murihiku, commercial fishers, recreational fishers, charter boat operators, tourist operators and environmental and community interests. A number of basic reasons for wanting to get involved were expressed:

- That improving fishing access may be having impacts on sustainability of local fish stocks
- Recognition that the fiord ecosystem is very special and valued features warrant protection
- Confidence that fishing and looking after fiords can be achieved together
- A strong conviction that local community management had the best chance of success.

Everyone agreed they wanted to be part of a group that was to become the Guardians of Fiordland's Fisheries and Marine Environment.

1800s. A questionnaire was designed to gather a variety of information by decade and the old codgers were visited. The information gathered was fascinating historically and also provided the context within which current fisheries developed. The strategy would not have been as robust without this perspective. And the old codgers felt valued as well.

The 'current codgers' (gathering detail by fiord)

Whereas information about features at the whole of Fiordland level had been compiled, evaluating features of each fiord was needed to decide on a suitable management framework. As this information was not available we had to find a way of tapping the knowledge of those who understood individual fiords well. A list of candidates was drawn up and a questionnaire designed for the Guardians to administer. Each Guardian took a number of knowledgeable individuals from the list and interviewed them.

Analysing this information revealed consistent patterns among the fiords and differences between the fiords and the outer coast that became basis of the fisheries framework developed in the strategy. Management recommendations developed from this framework focused members of the group on what had to be achieved collectively rather than being diverted into arguments about who was to blame.

Agency participation

With the widening of the Guardians interest to the whole of the marine environment in 2000, local members of the relevant agencies and authorities were invited to join the group in a supportive advisory role. A complementary relationship soon evolved. The Guardians shared information that the agencies needed but had no access to and the agencies offered their perspective and provided a very significant level of support to the group.

The Guardians' initiative attached no significance to agency boundaries - indeed resolving issues in the best interests of Fiordlands fisheries and the marine environment was the focus. Accordingly, agency members found themselves working outside of their usual constraints in search of solutions to issues that crossed all the usual boundaries - something refreshing and exciting.

This is in stark contrast to the usual operation of management agencies where the input they seek from the community is constrained by their legislative responsibilities. Some agencies find their objectives very difficult to achieve in isolation because of their narrow focus. Working with the Guardians and other agencies has presented an opportunity to move forward together.

Identifying issues

The Guardians brainstormed a list of 45 issues covering many topics associated with Fiordland's fisheries and marine environment. We needed a way to order issues and assign priorities as well as making headway with the strategy.

These examples highlight the importance of maintaining the 'balance of gifts and gains' - should the package be undermined by changing the balance of gifts and gains the integrity of the strategy will be put at risk.

What's in the strategy?

The final package was made up of four major components:

1. The fisheries component saw commercial fishing withdrawing from inside the habitat lines, and recreational fishing rules inside the fiords based on a 'fish for a feed' philosophy.
2. In the values of special significance component, 23 china shops that support extra special features were identified as well as eight representative areas that have since become marine reserves.
3. A range of potential impacts such as biosecurity risks, anchoring and pollution are also provided for.
4. Kaitiakitanga was expressed by runanga participation and involvement on the Guardians' throughout the entire process.

The need for compliance and monitoring the changes were also incorporated.

Fostering political support

Political support was fostered right from the start. In 2000 the Guardians met with Hon Pete Hodgson, Minister of Fisheries to seek his support. He was enthusiastic about an initiative where all the groups were working together in the interests of the marine environment.

From then on a summary of progress was also provided to the Minister for the Environment, Minister of Conservation and a number of interested Members of Parliament. As lead Minister of the Oceans Policy Ministerial Group, Hon Pete Hodgson recognised that this initiative could be shaping up to be a local example of the holistic philosophy underpinning Oceans Policy.

When the strategy was finalised the Guardians organised a presentation that Ngai Tahu blessed, the Ministers of Fisheries and the Environment addressed, as did Mahara Okeroa, Mark Solomon, Kaiwhakahere of Ngai Tahu and local politicians. At the celebration the Ministers made a strong commitment to have the strategy implemented two years from the day - a seemingly impossible task but one that was achieved within the deadline!

Why an Act?

Each component of the strategy could have been implemented by the appropriate agency, but in doing so the processes involved would all differ in steps and timing. There was a very real risk that the package of management measures would be altered and the 'balance of gifts and gains' compromised. The need to protect the integrity of the whole package justified special legislation.

Doubtful Sounds - all accomplished within six short weeks before the end of December 2005.

This is an impressive achievement for the agency/Guardians group. Such an output would not have been possible without an integrated approach and the commitment of agency managers and politicians.

Implementation: the Guardians and the agencies

The Guardians and agencies bring different but complementary skills to the integrated approach.

The Guardians bring their first hand knowledge and long experience of Fiordland to the table and this provides direction and a reality check for agency members. Most of the Fiordland Marine Guardians were original Guardians who had been on the group since its inception in 1995. The experience the original Guardians went through developing the strategy - the reasons for getting together, the process, the negotiation of gifts and gains and the philosophies incorporated is invaluable. That experience has been built into the new legislation and must be understood and expressed appropriately. Maintaining the integrity of the package at all levels, and ensuring that messages are accurate during the release of information is a key part of the Guardians' role.

The agency members bring knowledge and experience of their legislation, responsibilities and management mechanisms as well as the grunt and resources of their agencies. There have not only been benefits working with the Guardians but also between the agencies. Working as an inter-agency team allows agency members to deal with issues across agency boundaries. Understanding the whole provides a framework within which each agency fits and this is a good place to be.

Given the achievements, a combination of these features must be highly motivating, as the team is committed, energetic and co-operative - a hive of busy worker bees - there's been no place for drones!

Looking forward

There is still much to do to implement the four agency programmes, so neither the agencies nor the Guardians' workload is likely to decrease in the short term.

Monitoring the results of all the management changes is critical. Whereas the immediate priority is putting baseline monitoring in place, we hope that longer term results will provide the basis for considering whether other management changes might be appropriate or not.

Certainly, the Act contains a requirement for a five year review of the management package. Should the need for changes to the existing package be identified, the package that was negotiated and agreed between all parties will need to be revisited.

STATE OF SOUTHLAND'S COASTAL MARINE ENVIRONMENT – A HOLISTIC LOOK AT THE COASTAL MARINE ENVIRONMENT

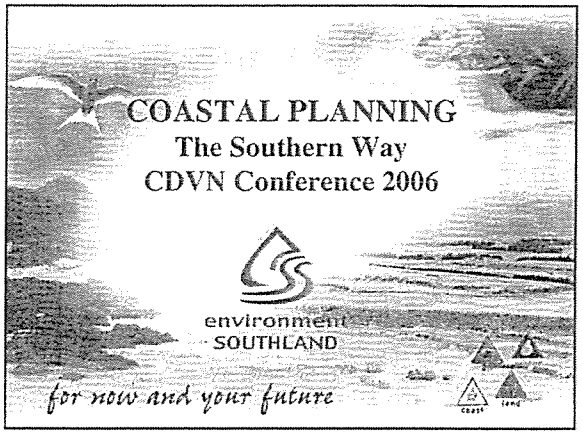
Dr Jane Kitson
Environment Southland

Southland's State of the Coastal Marine Environment website report (www.ara.org.nz) and hardcopy summary report was produced mid-2005. This report was developed, managed and prepared as collaborative effort involving a partnership between Environment Southland, the Department of Conservation, Southland District Council, Invercargill City Council and Te Ao Marama Inc. Other agencies, such as Historic Places Trust, Ministry of Fisheries and Maritime Safety Authority also made important contributions.

This presentation will illustrate Southland's unique approach and vision for this State of the Coastal Marine Environment report and give an outline of the contents of the report, highlighting areas of interest.

COASTAL PLAN – PROTECTION OF COAST

Bronwyn Graham
Environment Southland



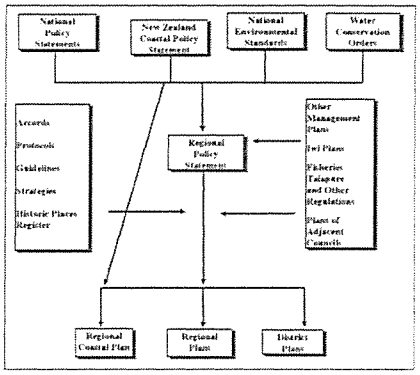
COASTAL PLANNING – MANAGEMENT AND EXTENT

- Agencies with responsibilities in the coast
- The Resource Management Framework
- The Regional Coastal Plan for Southland
- The CMA and the coastal environment

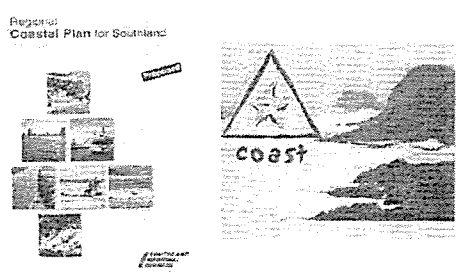
Statutory responsibility in the coastal environment

- MOC, DOC, Minister for the Environment, Ministry of Fisheries, Ministry of Health, Maritime NZ, Ministry of Commerce, Regional Councils, District Councils, and Historic Places Trust
- Regional Council: Regional Policy Statements, Regional Coastal Plans, Coastal Permits, Oil Pollution, and Regulation of surface water activity in coastal marine area

Coastal Planning Framework

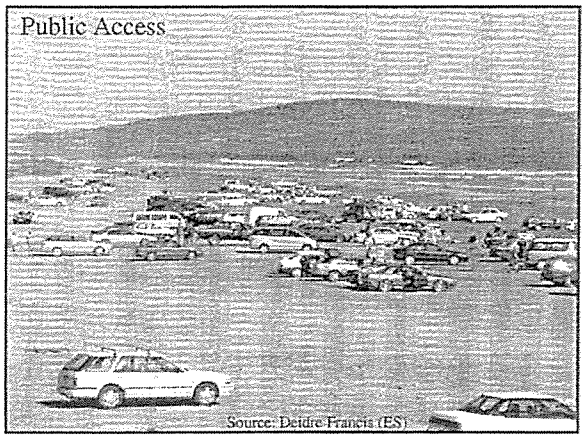


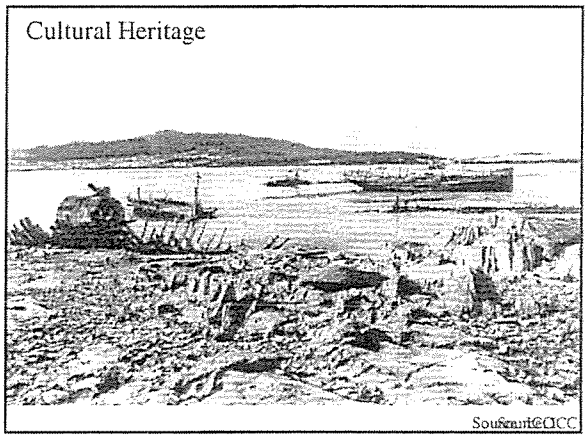
The Coastal Plan

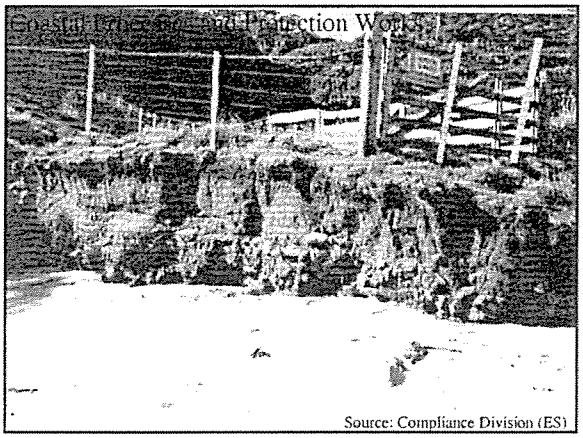


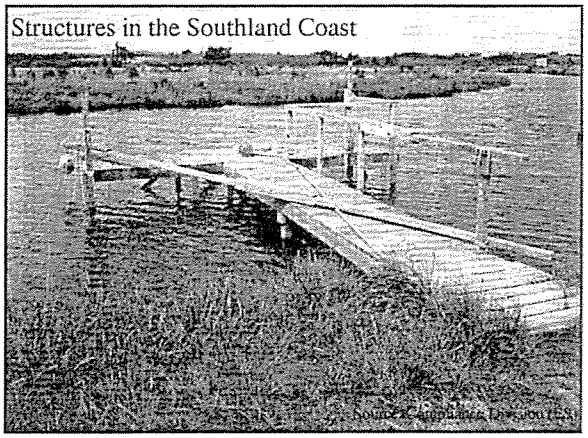
The Coastal Marine Area

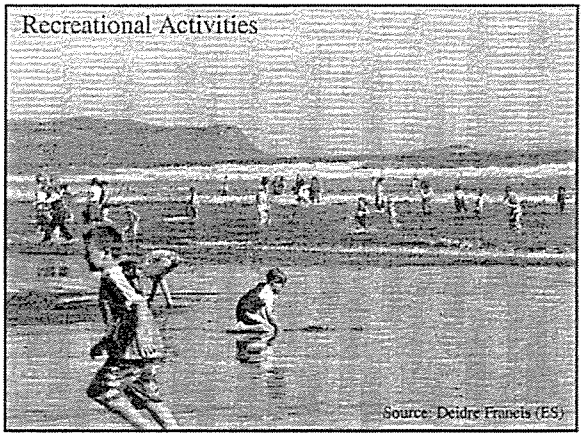
- Mean high water springs out to the 12-nautical mile territorial sea limit (22.2 kilometres)
- Awarua Point to Brothers Point
- 3,000 kilometres of coastline; approx one seventh of New Zealand's coastline











Other Coastal Plan Sections

- Seabed and Foreshore
- Water – discharges to the coast etc
- Air – quality
- Cruise Ships
- Marine Farming
- Surface Water Activities - boats

Recognition of sand dunes

- Recognition that beaches, sand dunes, wetlands, etc., provide a buffer to coastal processes
- Coastal processes can be adversely affected by the use and development of the coastal marine area; and vice versa
- Policy: Recognise and maintain the ability of natural features to protect the use, or development of land, and where appropriate, take steps to enhance that ability

Coastal Protection Works

- Coastal plan manages in a way so that coastal protection works are constructed of materials appropriate to the site; and
- Coastal protection works are reconstructed only where they are the best practicable option for the future
- Integrated management aspect

Removal of gravels and natural materials

- Coastal Plan policy to protect beach profile and character from the effects of removal of sand, shell, shingle, and any other natural materials
- Consent needed for the removal of sand, shell, shingle or other natural material, and for removal of live vegetation
- The removal of sand, shingle or other natural material by mechanical means from the foreshore of Colac Bay west of map reference D46/175155 is a prohibited activity

Beach nourishment

- Provide for beach renourishment where similar materials similar are used, and where it is impractical to remedy the loss or non accumulation of beach materials
- Consent is generally needed for the deposition of material.
- Exception: Oreti Beach

COASTAL PLAN – IMPLEMENTATION

- What Southland has done - Implementation
- The Southern Way – The Process
- Community Input – How and What
- Not a plan that just sits on the shelf - a living document

Southland Implementation

- Community Input to set up and prioritise projects to put the Coastal Plan into action
- Community priorities for coastal management in Southland
- We need to know that the Coastal Plan is effective and achieving what the community wants to achieve

What's happening now?

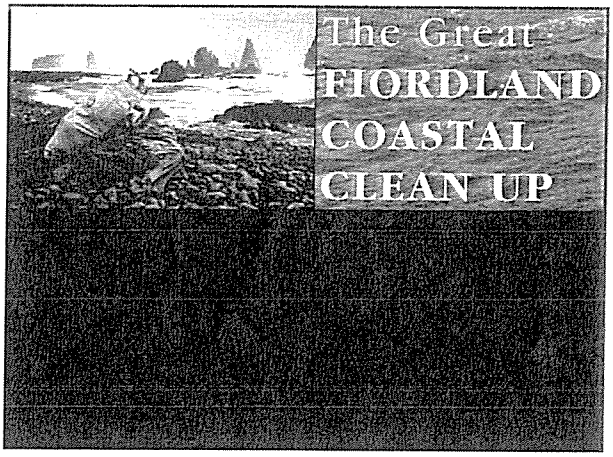
- Joint integrated management project with the SDC to address subdivision in the coast and the impact on natural character
- Investigation into commercial surface water boating in Milford Sound
- SOE and Coastal Roadshow

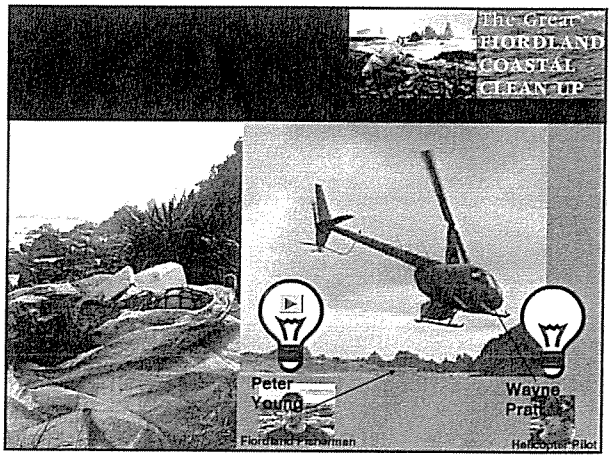
Coastal Planning – the Southern Way

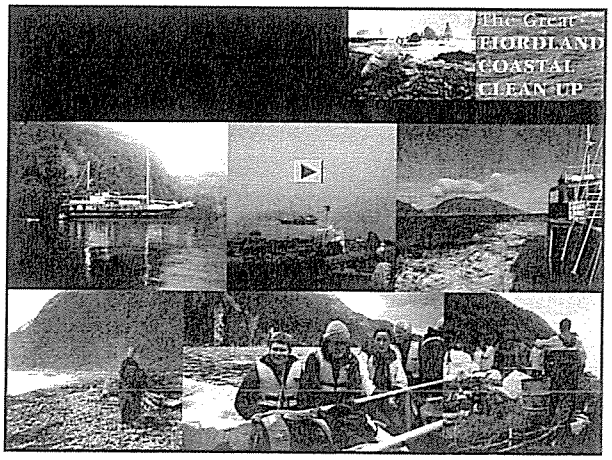
Thank you

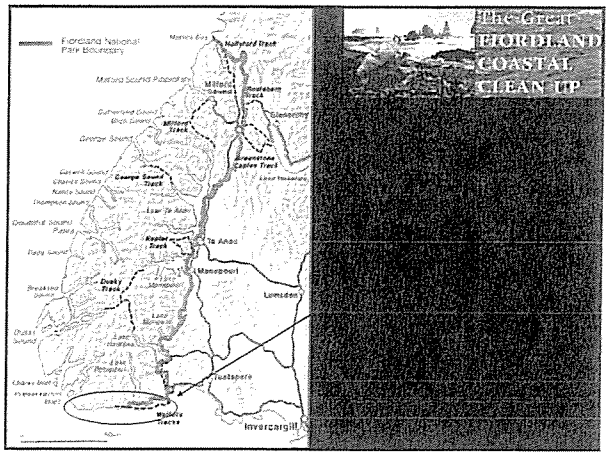
FIORDLAND CLEANUP – INDUSTRY'S INVOLVEMENT IN CLEANING UP FIORDLAND INCLUDING DUNES

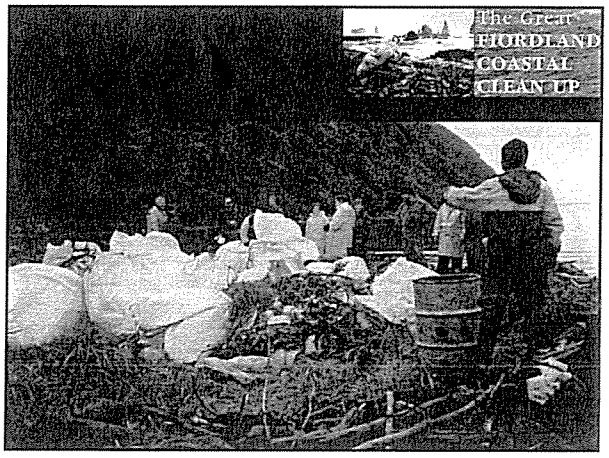
Ian Buick
South West Helicopters








The Great
FIORDLAND
COASTAL
CLEAN UP
Fiordland National Park Boundary
Milford Track
Routeburn Track
Greenstone Caples Track
George Sound Track
Kepler Track
Te Anau
Manapouri
Lumsden
Ducky Track
Tuatapere
Invercargill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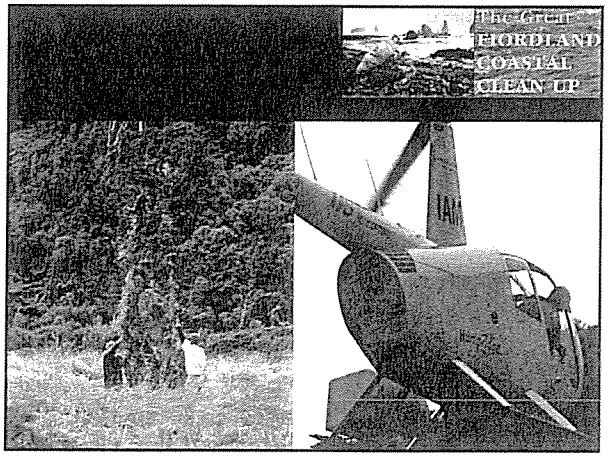
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CLEAN UP

THE ORETI BEACH MANAGEMENT – INTEGRATED APPROACH

Dallas Bradley
Environment Southland

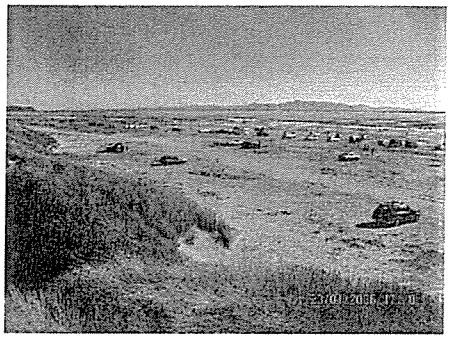
Memorandum of Understanding
Oreti Beach Management
Who is involved?

environment SOUTHLAND
Te Taiao Tonga

Department of Conservation
Te Papa Atawhai

Invercargill city council
CITY OF WATER AND LIGHT

Dallas Bradley
Hazard Mitigation Planner
Environment Southland



Oreti Beach
A popular recreation beach 10km west of Invercargill

Why?

- To clarify management roles of the above organisations that have a statutory interest in Oreti Beach.
- To develop a co-operative approach to enhancing the amenity value of Oreti Beach.
- To develop pragmatic solutions to the day to day management of activities on Oreti Beach that recognise the skills, resources, expertise and functions of the respective parties.

Context Cont'd

- Environment Southland's role in respect of marine oil spills;
- the experience Environment Southland's statutory role under the Resource Management Act and the Harbours act, particularly in relation to the coastal marine area;
- of Environment Southland, City Council and Department of Conservation staff as enforcement officers;
- that in exercising the roles agreed to in the above Memorandum of Understanding, the respective parties may utilise/liaise with the following organisations:
- the Department of Corrections (periodic detention)
- the Oreti Surf Club;
- "beach care" groups
- Royal Forest and Bird Society
- Ministry of Fisheries

What? – The Agreed Roles

Invercargill City Council

Parks Staff:

- Arrange the collection and disposal of rubbish, litter and refuse (in particular, dangerous litter, including beer bottles) within 1.5 kilometres either side of the Dunns Road entrance.
- Arrange the collection and disposal of rubbish, litter and refuse, including beer bottles, beyond 1.5 kilometres either side of Dunns Road entrance, where it is a nuisance or a health hazard.
- Liaise with the New Zealand Police to manage vehicular behaviour on the beach by reporting, and acting as a witness to, incidents of unlawful vehicular use.
- Enforce the provisions of the Rural Fires Act in respect of bonfires on the beach. (Bonfires require a permit under this Act).
- Contact People: Parks Manager, Sandy Point Ranger

Invercargill council
"CITY OF WATER AND LIGHT"

Invercargill City Council cont'd

Parking Enforcement Staff:

- Ensure compliance of stationary vehicles with the Transport Act, particularly in respect of:
  - warrants of fitness;
  - motor vehicle registration, especially within 1.5 kilometres either side of Dunns Road; and
  - inconsiderate or dangerous parking.
- Contact Person: Parking Manager

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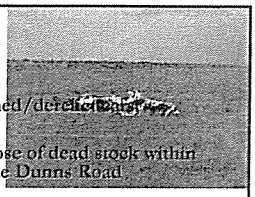
Department of Conservation
Te Papa Atawhai

DoC



- Remove and dispose of abandoned/derelict [illegible]
- Remove, bury or otherwise dispose of dead stock within 1.5 kilometres of either side of the Dunns Road entrance;
- Remove, bury or otherwise dispose of dead stock beyond 1.5 kilometres of either side of Dunns Road where they are a nuisance or a health hazard;
- Remove, bury or otherwise manage stranded or dead marine mammals;
- Liaison with the New Zealand Police to manage vehicular behaviour on the beach by reporting, and acting as a witness to, incidents of unlawful vehicu[illegible]

environment SOUTHLAND
Taiao Tonu

NZ Police

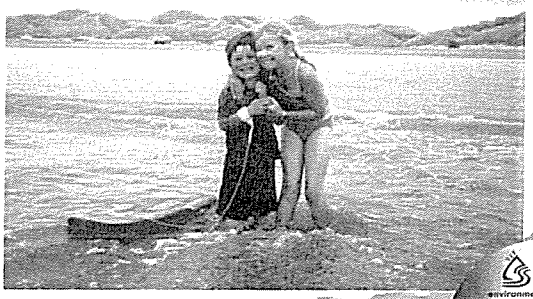
- Enforce the motor vehicle speed limit, especially 1.5 kilometres either side of Dunns Road;
- Ensure compliance of mobile vehicles with the Transport Act, in particular, control;
- careless and dangerous driving;
- warrants of fitness; and
- motor vehicle registration, especially within 1.5 kilometres either side of Dunns Road.
- Control the use of firearms;
- Assist Environment Southland to undertake its Harbourmaster functions;
- Issue shark warnings;
- Maintain general law and order.
- Contact Person: Control Management's Officer

environment SOUTHLAND
Taiao Tonu

Observations

- Excellent reference document.
- Still some buck passing but hopefully it is lessened.
- Few debates over who is responsible for what.
- What debates there are arise out of ignorance of the MOU and other things (for example, boundaries).
- Biggest problem is that the document is poorly institutionalised – some people are aware of it but a lot are not!

Questions?



SUPPORTING COMMUNITY INVOLVEMENT IN COASTAL MANAGEMENT

Robert Guyton
Chair, Riverton Landcare Group

In the field of sand dunes, I am very much an amateur. Nevertheless, like most New Zealanders, I have had some experience of them. I spent the first three years of my life living beside them near Nelson at Tahunanui, the translation of which means 'big dune'. I have no memory from that time at all, although my liking for them may have begun there. Certainly, my interest in sand dunes intensified in my teens when I discovered that the rolling sands of Tahunanui served as shelter for nude sunbathers and skinny-dippers. Dunes clearly serve a variety of valuable purposes. One thing they don't provide for is a comfortable bed. I spent a night in a sleeping bag on top of a towering sand dune at Aramoana and can confirm that sand is a very unforgiving mattress, one which fills in behind the sleeper at every turn and forms distinctly uncomfortable humps which can't easily be flattened back down.

Because I can't further your knowledge any more than that about the nature of dunes, I will speak instead about a project based on another 'fragile habitat', a flax wetland and my involvement with a community group created to manage it. I hope that any ideas that you glean from this outline of our group's activities will be useful wherever you are involved with any community driven dune, beach or coast care groups.

The Riverton Estuary Care Society Incorporated is now 9 years old, or thereabouts. Several of our founding fathers and mothers, spawned the idea for the group over coffee and carrot cake in a home overlooking the Jacobs River Estuary at Riverton/Aparima. Our original thoughts about the values of the estuary were broad and we were not panicked into forming because of any pressing issue, as some groups are. We decided that we had the will to get involved with our local environment more closely and the estuary was a central feature for the town and hadn't, we thought, been 'bagsed' by anyone. We were to discover later on however, that tangata whenua had been watching over te wahi ra for some time, albeit discreetly and that a number of others had vested interests in the estuary. We called a public meeting to gauge public opinion, loaded the panel with high ranking officials from the Councils, DoC, Fish and Game, precluding any opposition from the duck hunting and white baiting fraternities and enjoyed a very successful beginning to what was to become an official 'Land Care' group. Since our inception we have focused our activities on the protection of a 6 hectare flax wetland, threatened initially by the plough and the expansive ideas of its cow-farming owner and now happily, safe. At the time that we proposed the purchase and development of the 'flax swamp', it was not commonly thought, around our town anyway, that such areas were of any real value. We believe that that perception has changed now in part due to our public relations and education programme, involving newspaper and television coverage along with other colorful promotions like our Estuary festival and Mud Man races. The development of the wetland has involved earthworks to form ponds and waterways, the construction of bridges and a dam, planting native trees and broom and gorse control. Funds for these activities have come from various sources, with the initial purchase grant coming from Environment Southland who continues to support the society by meeting costs and the valuable services of their Sustainability Officer who attends our monthly meetings and keeps us motivated and moving in the right direction.

ORETI BEACH SAND DUNES

Robin Pagan
Parks Manager, Invercargill City Council

Southland has approximately 3400 kilometres of coastline. Much of it consists of rocky outcrops between which are several beaches and associated sand dunes. The most substantial of these in the Invercargill district is Oreti Beach, starting from the mouth of the Oreti River (New River Estuary) and extending to the north.

Thirteen kilometres of the south-west facing beach and its associated sand dunes lie in the Invercargill City Council district and these dunes along with the 2000-hectare Sandy Point domain are managed by the Invercargill City Council Parks Division. The sand dunes that you see today are highly modified, the result of the introduction of marram grass.

In geological terms the Sandy Point peninsula is of very recent origin and was probably formed mainly within the last 6000 years. It is believed that the greatest influences on the formation of Sandy Point and the surrounding area have been the two high sea levels of the Pleistocene period. These two sea levels were approximately eight metres and two metres above the present day mean sea level. Possible evidence of the eight-metre sea level is visible in the deposit of bedded gravels which forms the high bank on the eastern side of the Oreti River in the vicinity of the Dunns Road bridge. After the Otatara gravels were deposited to form the Otatara peninsula, it is believed that there was a steady and protracted lowering of the sea level. Later the sea rose again to around the two-metre level and that rise was probably responsible for the cliffing of the Otatara bank of the Oreti River.

The radiocarbon dating of shells, found in a shell bed at Otakau Creek near West Plains, puts the date of this two-metre sea level at somewhere in the vicinity of 4600 years. It is probably that during that period the formation of Sandy Point commenced, as an off-shore bar, at the mouth of the Oreti River. A subsequent lowering of the sea level is assumed to be responsible for the deposition of the storm-beach sequence of Oreti shingles, which occurs in the northern part of the Domain. Radiocarbon dating of shells taken from gravel beach ridges to the north of the Domain gave ages varying from about 1300 to 4000 years.

The shingles of Sandy Point Domain are mainly greywacke with some quartz and small quantities of granite and other pebbles of Fiordland origin. Some of the old stormbeach shingles contain numerous shell fragments. The sands of Oreti Beach are medium to fine while the wind deposited sands inland are mainly fine sands.

A littoral or transverse dune system extends for the entire length of Oreti Beach, but becomes progressively smaller at its southern end. Behind this littoral dune system, a series of lateral dunes extends across the peninsula. The lateral dunes are most marked on the eastern half of the peninsula. They attain their greatest development in the vicinity of Daffodil Bay. To the north of the neck of the peninsula the sequence of storm beaches separates the lateral dunes from the transverse dunes. This feature does not occur elsewhere on the peninsula. The lateral dunes attain their greatest heights at their eastern extremities where they terminate fairly abruptly near the Estuary shore.

As well as general erosion over the whole Domain, serious erosion also occurred along the foreshore of Oreti Beach where a large section of foredune, some two kilometres long, eroded away. That erosion occurred some time between 1865 and about 1880. The sea washed in and created a large bight south of what is now the main entrance to the beach. As early as 1886, there were concerns that the sea might break through to the Oreti River at that point and turn Sandy Point into an island. It was in that area that Thomas Waugh concentrated so much of the marram grass plantings in order to stabilise the dunes and prevent further encroachment. However, it was not until the early 1920s that moves were taken, which resulted in the foredune being restored to its original line. Brush fences of stakes driven into the sand and with manuka woven through them were constructed along the original line of the foredune.

In the late 1880s and 1890s, thousands of marram grass plants were planted in various parts of the Domain, and considerable quantities of seed were sown. Initially, success was limited and sometimes the results were quite discouraging – but gradually the marram began to take over and hold the sand. As well as the rabbits, the occasional fire, overstocking and the removal of trees for timber and firewood, all contributed to the erosion. Apart from marram grass, the most successful of Thomas Waugh's introductions were the tree lupin (*Lupinus arboreus*), broom (*Cytisus scoparius*) and the elder (*Sambucus nigra*), all of which do so well in the Domain.

Erosion continued to be a problem, although not on the scale of the 19th century. The sand still moved with the wind, dunes formed and reformed, forest was buried or partly buried by wandering dunes and the dead remains of earlier buried forests were uncovered. Various attempts were made to plant trees for protection purposes, but it was only from about 1946 onwards that there was any system to the tree planting. This was the result of a report commissioned earlier by the borough of Invercargill - Sandy Point Domain Afforestation Scheme, by C M Smith BA, BSc (Ranger) State Forest Service, 1924.

While today the stretch of coastal sand dune has been substantially stabilised, it has come with a cost. The introduction of the marram grass for the protection of the dunes has resulted in the loss of most of the original native sand dune species.

- Information taken from the Invercargill City Council Management Plan of Sandy Point Domain.

THE DISTINCTIVE CHARACTER OF THE DUNES OF FOVEAUX STRAIT & STEWART ISLAND

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Introduction

The dune systems of Foveaux Strait and Stewart Island (Figure 1) have several features that distinguish them from other New Zealand dunes. With few exceptions, these dunes are fully exposed to some of the most powerful and persistent westerly winds in New Zealand. Secondly, embayments in the central section of the Strait contain complex dunes systems which comprise both progradational sequences of foredunes and transgressive dunes. Parabolic dunes, showing a range of morphologies, occur on most exposed sites. In some cases these dunes have transgressed well inland and reached considerable heights. Thirdly, some quite remarkable dune systems have formed where transgressive dunes have developed at an oblique angle to the shoreline. Most of the New Zealand examples of headland-bypassing dunes occur in Foveaux Strait.

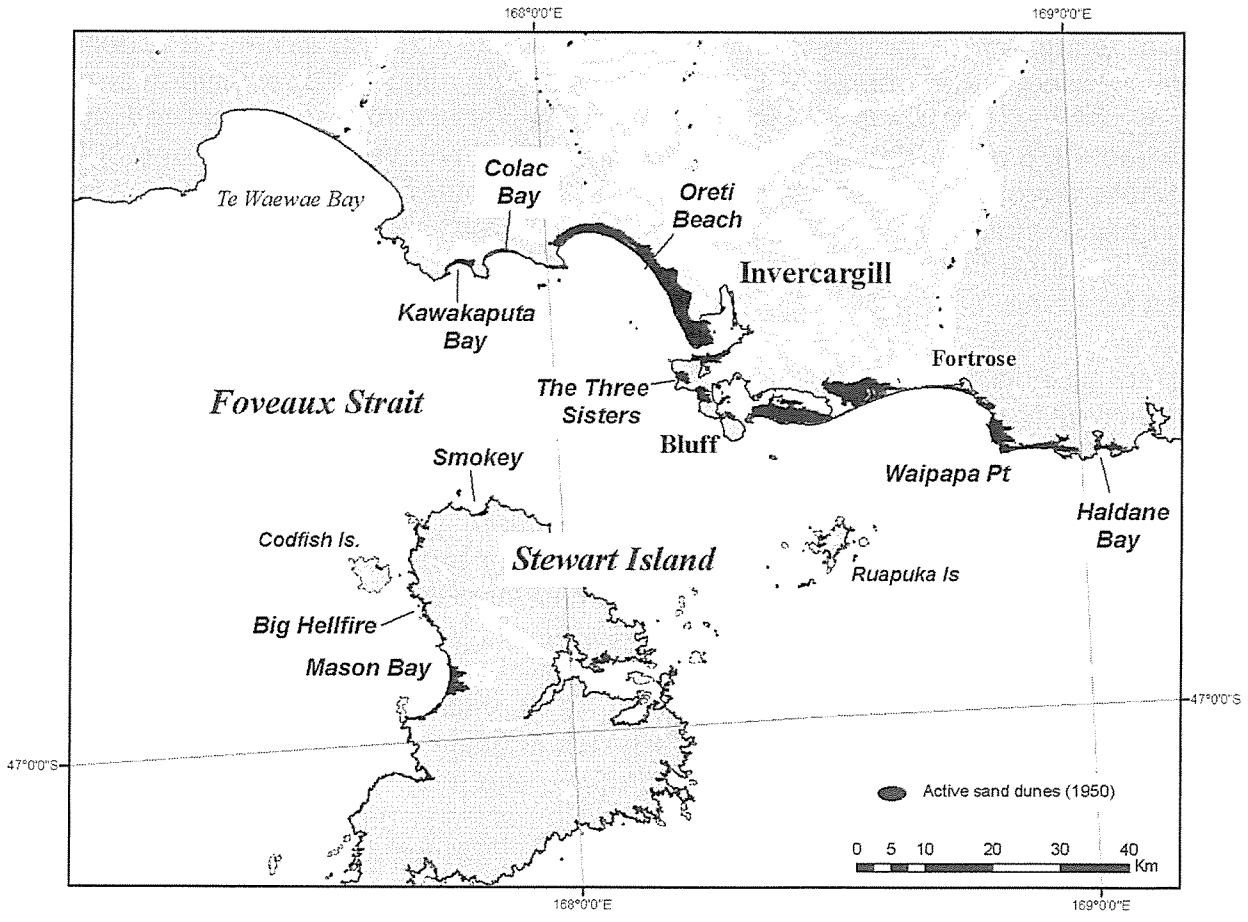

Figure 1: Location of dune systems discussed in the text.

Headland by-passing dunes and complex barriers

The interaction of headlands and the prevailing westerly winds leads to some typical and very unusual dune systems along the Foveaux Strait coastline, particularly on the northern side. Foveaux Strait contains some exceptional examples of headland by-passing dunes, formed as sand is blown alongshore, inland and over the downwind headland. In this way sand "by-passes" the usual path of marine sand transport around the headland. The dune systems of Sandhill Point and Haldanes Bay, at the western and eastern extremes of Foveaux Strait, are exemplars of this dune form. Unfortunately, this process is only conserved at Sandhill Point – marram grass and farming operations have stabilized the remaining headland by-passing dunes.

The interaction of westerly winds and headlands results in a gradual increase in energy from west to east in a series of zeta curve beaches (Kawakaputa Bay, Colac Bay and Oreti Beach). The late-Holocene barriers in these embayments display two contrasting morphologies. The western end comprises a prograded foredune barrier (i.e. a barrier made up of a series of foredune ridges). The eastern (exposed) end of the barrier comprises a transgressive dune system, usually comprising nested parabolic.

Evidence of episodic dune development

There is widespread evidence of two and probably more episodes of transgressive dune development in the dune systems of Foveaux Strait, indicated by trends in soil development, vegetation cover and morphology. Each phase represents the breakdown of a primary dune, usually a foredune, and the downwind migration of parabolic dunes. Cycles of destabilization and stability have been described at other locations in New Zealand (e.g. Muckersie & Shepherd, 1994) and are probably widespread. The conditions that lead to disturbance are not well understood. Human activity has caused some disturbance, but many extensive dune systems in southern New Zealand have never experienced intensive anthropogenic disturbance. In any case, the earlier phases of transgressive dune formation, in southern New Zealand and elsewhere, pre-date Maori or European occupation. Dixon (2003) attempted to date (using dendrochronology) and explain the formation of a series of historic blowouts along the Tahakopa Bay coastline, South Otago. Dixon concluded that these dunes most likely formed as a result of exceptional drought conditions in the 1920s and 1930s, in conjunction with phases of strong onshore winds.

A study of Sandhill Point (Hakapureirei), in Fiordland indicated the formation, migration and stabilization and re-vegetation of long-walled parabolic dunes occurred over a comparable period (Hilton and Konlechner, 2005). The life cycle of 'parabolic 6', Mason Bay, is also similar. Were these geographically widespread dune systems affected by the same climatic trigger? The issue would be relatively easy to resolve with the appropriate geomorphic dating techniques.

Which raises the question of whether the relatively undisturbed dune systems of Fiordland and Stewart Island are in a phase of transgressive dune system expansion or contraction? I'm not sure. Sandhill Point appears to be stabilizing and the vegetation cover expanding. The sand budget of Mason Bay has been much disturbed by marram grass – but there is no evidence of rapid or consistent expansion prior to the general establishment of marram grass. Considering the condition of dune systems prior to the widespread introduction of marram grass - my feeling is that most were in the mid to latter stages of the unstable phase of the cycle. This phase may last many tens or

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The Comparative Seed Ecology of Marram Grass (*Ammophila arenaria*) and Pingao (*Desmoschoenus spiralis*).

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Abstract

Marram grass (Ammophila arenaria) has been used as a dune stabilising species in New Zealand for more than 100 years and has become a primary threat to the conservation values associated with the dune landscape throughout New Zealand. There is very little known about the seed ecology of marram grass in New Zealand conditions, or its native counterpart Desmoschoenus spiralis. Seed dispersal studies of A. arenaria and D.spiralis have not been undertaken and this has left a gap in the ecological understanding of the invader and emergent plant paradigm in the New Zealand coastal dune context.

The seeds from both species were collected during the 2004 and 2005 summer periods for eight weeks from Toko Mouth in South Otago. The Toko Mouth site was monitored for seasonal changes in sand movement, wind regime, temperature, and rainfall during the study period. Seeds of both species were germinated in a climate control unit as fresh seed, dried seed (22°Celsius for 7 days), stratified seed (4°Celsius for 42-63 days), and tested for viability using tetrazolium testing. Dispersal studies were also undertaken using measured wind speeds in testing Phase I dispersal (initial dispersal from the parent) and Phase II dispersal (movement from or along a surface). The relative rollability of seeds of both species using a rollability apparatus was used for the first time in seed ecology to test the effects of morphological differences on dispersal behaviour in both species.

Objectives of the Research

The objectives of the research were to characterise and understand the differences and similarities in seed ecology between the two species. Principally in the factors that affect the successful germination of either species and to gain an understanding of their

- Phase II dispersal is the horizontal (movement along the surface to another area) or vertical movement (incorporation of seed into soil) of seed after the initial dispersal.

Site Selection

Toko Mouth Beach is situated on the east coast of the South Island of New Zealand, approximately 50 kilometres south-east of Dunedin and 20 kilometres east of Milton. The beach extends approximately 5-6 kilometres southwards from the outlet of the Rocky Valley Creek to Measly Beach. The selection of the Toko mouth site for seed collection was made principally on the adjacent populations of *A. arenaria* and *D. spiralis* to one another. Toko Mouth is the largest natural site of pingao available for sampling on the Otago coastline.

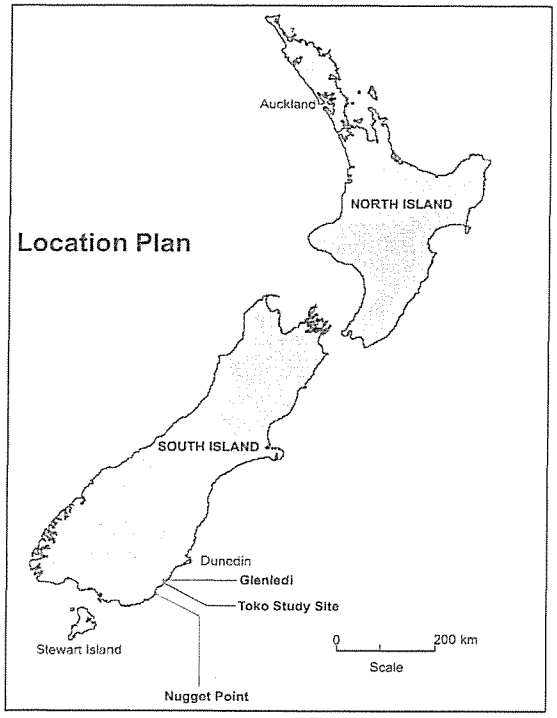

Figure 1 Location plan of Toko Mouth and weather stations.

Methods

Germination and Treatment

Five flower spikelets were collected weekly from *A. arenaria* and *D. spiralis* at Toko Mouth over two summers from the 12th January – 1st March 2004 and the 10th January – 28th February 2005. The seed was removed from the seed heads counted, photographed, and the mean seed weights of each species recorded. The fresh seed from both species was then divided into three treatments;

- fresh seed
- stratified at 4°Celsius for 42-63 days
- dried in paper bags at 22°-24° Celsius for 7 days

distances drawn at 10 cm, 20 cm, 30 cm, 40 cm, 50 cm, one metre, and two metres, across the surface of the plastic. It was evenly covered with a 5mm covering of *Vaseline* petroleum jelly (Cousens, 2001). Five separate plastic sheets were used as individual tests using a total of 500 seeds for each species on the sample sheet. The seeds of both species were released separately in 50 seed lots and the seed caught onto the plastic sheet by the petroleum jelly. The seeds were counted and the number of seeds within a distance group recorded.

Video and Microscope Observation

A. arenaria and *D. spiralis* seed were videoed to look at the responses of both seed species to a sand surface. Microscopic videoing was also undertaken in the laboratory to learn more about the attributes of the outer hairs of the *A. arenaria* seed.

The Relative Rollability of Seed

Relative rollability is normally associated with the measurement of the movement of sand grain particles. Rollability is related to the angle of the slope on which a grain rolls with a uniform motion at a given velocity on a smooth uniform surface. The rotation of the cylinder pulls the seed upwards until the slope makes the seeds roll downwards. Thus the time its takes for the seeds to travel down the cylinder is the test of the seeds rollability. Weight, density, and shape are important properties that influence the behaviour of particles during transport over a sand dune surface (Winkelmolen 1971).

The use of the video observation revealed differences in the behaviour of the seeds of both species on the sand surface. Initial thoughts were that these were based on the physiological differences of the seeds between the two species. To test this behaviour relative rollability testing was undertaken.

- 10 tests of 50 dry seeds of *A. arenaria*
- 10 tests of 50 dry seeds of *D. spiralis*
- 10 tests of 50 wet seeds of *A. arenaria*
- 10 tests of 50 wet seeds of *D.spiralis*

Results

Germination and Viability

Species	Harvesting Season	Fresh Seed (%)	Dried Seed (%)	Stratified (%)
Ammophila arenaria	Jan - Feb 2004	40.08 %	7.37%	2.91 %
Ammophila arenaria	Jan - Feb 2005	15.90 %	7.75%	11.82%
Desmoschoenus spiralis	Jan – Feb 2004	1.563 %	0.25%	0.23%
Desmoschoenus spiralis	Jan – Feb 2005	11.00 %	2.5%	1.77%

Table 2 The comparative results of *A. arenaria* and *D. spiralis* between the two sample years and their associated treatments.

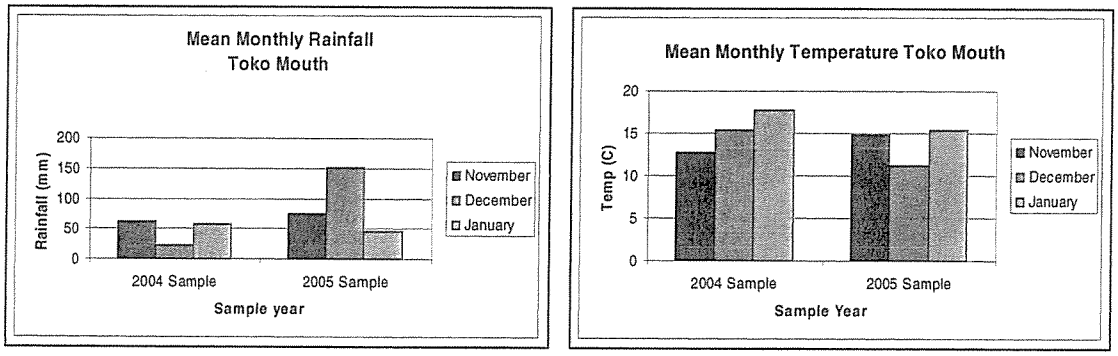

Figure 4 The comparative differences in the weather patterns between the two sample periods.

The seasonal weather patterns examined from weather station data and measured in the field showed a reversal in climatic variables between the 2004 and 2005 sampling years (Figure 5). *Ammophila* produced the most germinable seeds when the early summer months of flowering were relatively hot and dry, with consistent wind speed and direction in 2004. *Desmoschoenus* seed production was poor during this weather pattern, most likely due to pollination failure and/or a maternal response to drought stress, resulting in an observed accelerated dispersal of un-ripened seed. The hotter temperatures and lower

changing seasonal wind patterns, alters the movement of sand and assists in breaking seed banks open (or burying them further). These factors, accompanied with increases in ground temperature, are the principal factors in stimulating germination of seed that has been stored in dune areas, rather than the cold stratification itself.

Seed shape and size was generally very consistent in *A. arenaria* for both sampling periods. In *D. spiralis* there were inconsistencies in the shape and size of the seeds sampled over the two periods. These inconsistencies are probably due to pollination failure and may have been instigated because of the variation in weather patterns. Rapid root development was observed in *Ammophila* after germination, while *Desmoschoenus* did not develop roots in any of the seed germination trials.

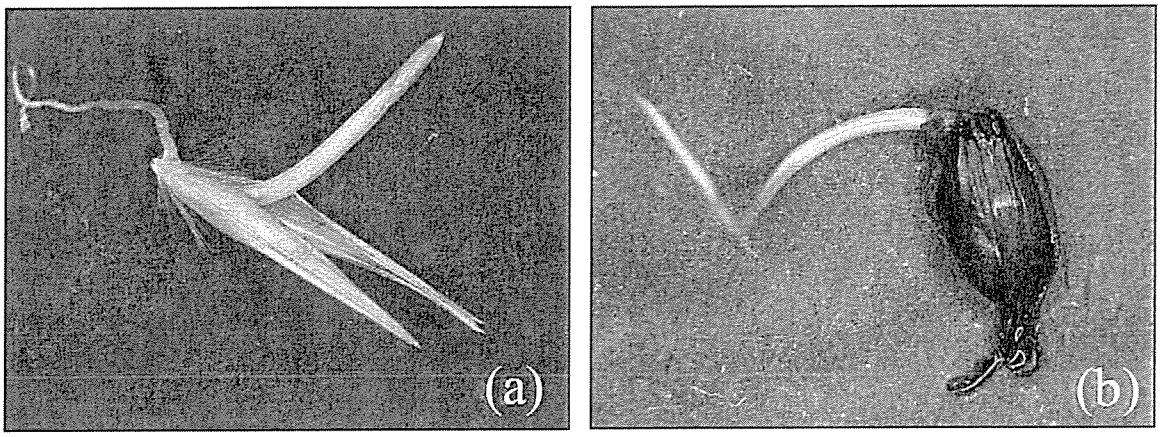

Figure 5 *Ammophila* germination showing rapid root development after the emergence of the cotyledon (a). *Desmoschoenus* seed showing the emergence of the cotyledon but no root development (b). (Photographs Paul Pope).

Phase I – Primary Distribution Patterns

Primary distribution patterns refer to the post dispersal distribution of seed from the maternal parent and the experimental method described earlier to measure that distribution (Willson and Travest, 2000).

- The seed shadows showed that *A. arenaria* had more capacity to disperse a greater distance from the parental point source (78.22% dispersal shadow ≥ 1.0 metres).

- At higher wind speeds over ≥4.0 – 5.0 metres/second *Ammophila* seed moved in a rapid downward spiral motion to the ground and moved along the dune surface.
- Even at the lowest recorded wind speed of 0.66 metres/second the *Ammophila* seeds travelled a maximum distance of 933.60 centimetres and a minimum of 248.60 centimetres.
- The maximum wind speed recorded at 7.10 metres/second saw *Ammophila* seeds travel an initial distance of 20 metres.

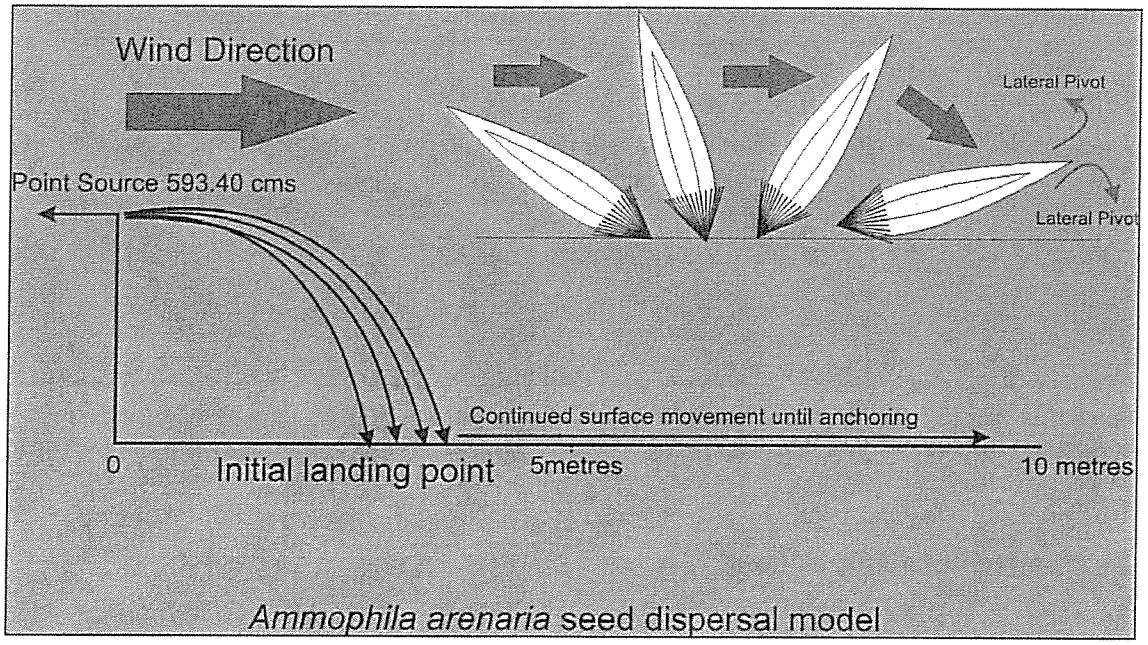

Figure 8 *A. arenaria* seed dispersal model. The dispersal testing confirmed the earlier findings of the video analysis that *Ammophila* seed uses its outer hairs to anchor and orient itself into the wind on landing onto the surface.

D. spiralis had none of the aero-dynamism of *Ammophila* seed with a smooth outer testa and no external outer hairs.

- At high wind speeds (> 3.0 metres/second) the seed relied more on the surface micro-topography to hold itself onto the surface.
- Seed had the capacity to be blown 10 metres at wind speeds >5.0 metres/second. This was rare in the samples undertaken with most seeds moving ≤3.0 metres even at a variety of wind speeds.

The short distances of the Phase I seed shadows means the opportunities to escape from the shelter of the parent plant group for further Phase II dispersal are likely to be rare.

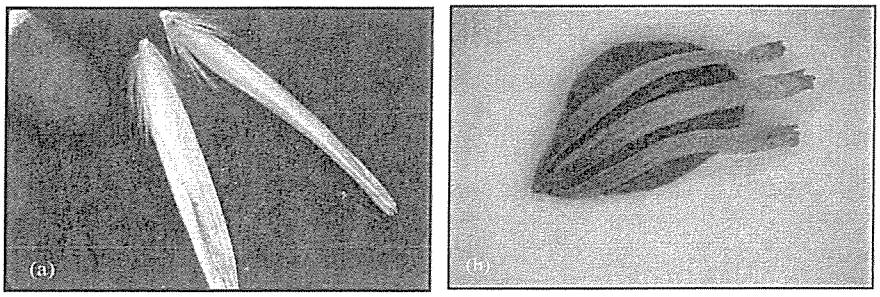

Figure 10 Comparison of seed shape in *A. arenaria* (a) and *D. spiralis* (b). Seed shape is a determining factor in relative rollability experimentation.

Ecological Consequences

Field observations showed that *Ammophila* seeds were found in aggregated clumps around the parent plant after Phase I dispersal. However, as Huiskes (1977) and Pickart (1997) found, seedlings were observed in damper leeward slopes of dune ridges around the Toko Mouth site, and always away from the moribund stabilised mid zones or deflation basin of the dune landscape. This implies that germination success is far greater away from the parent plant and Phase II dispersal from the aggregations is critical for seedling establishment. With an aerodynamic seed capable of aerial and terrestrial movement to suitable leeward areas, *A. arenaria* seed has the opportunity to occupy new sites of the local dune landscape. While broader Phase II dispersal of *Desmoschoenus* is possible, it appears rare in the dune landscape, and the build up of seed banks close to parent groups relies heavily on changes to environmental conditions to facilitate further Phase II dispersal. Colonisation by *Desmoschoenus* seed appears tenuous when in direct competition with *Ammophila*, and opportunities to colonise areas outside of parental group limited. The short dispersal of ≤1 metre for Phase I dispersal in *Desmoschoenus*, the influence of micro-topography on Phase II dispersal, and the aggregated nature of dispersal suggest that seedling establishment is most likely to occur close to the parent point source, and probably only after the development of a seed bed. Several factors are likely to influence this likelihood, the proximity to the parent group, the possible mortality of the parent group (thus reducing any parent/seedling competition), and the role of abiotic factors disturbing the sand cover of the seed bed to activate germination. Such close dispersal appears to contradict theoretical advantages of establishing new seedlings away from kin competition. However, it may be that the production of seed

Conclusions

There has been considerable cost to agencies undertaking and planning the eradication of *A. arenaria* from natural areas in New Zealand and overseas (Pickart, 1997; Department of Conservation, 1998; Hilton and Duncan, 2001). Understanding the movement of seed in terms of dune orientation and wind regimes may provide more targeted opportunities for eradication in the field. By targeting vegetative growth and areas where seed dispersal is most likely through observation and measurement, eradication efforts may be strengthened.

The short distance dispersal of *Desmoschoenus spiralis* into aggregated seed beds means that restorative efforts that reintroduce plants into degraded dune areas may be enhanced by artificially opening those beds to stimulate germination. Restorative efforts have concentrated on introducing plants and eradicating competition to increase abundance, but natural regeneration may be achieved by disturbing existing seeds for recruitment into the restored areas, and provide a broader genetic pattern within restored communities (Bergin and Herbert, 1998).

The investigation into dormancy and the treatment of seeds revealed that stratification may not be a factor in breaking dormancy of *Desmoschoenus*. The cold storage of seeds in a seed bed was a natural phenomenon, rather than be a requirement for germination. The advent of disturbance and warmth is probably the critical factor in achieving germination. This has repercussions for plant propagation and those who are actively growing plants for restorative efforts.

The varied seasonal climate affected both species' ability to flower, set seeds, and disperse viable seeds. The reproductive effort of *Ammophila arenaria* in setting germinable seeds during dry conditions can be negated by the conditions seeds are dispersed into, where desiccation and burial by dry moving sand is highly likely. In *Desmoschoenus*, the drier conditions and rapid dispersal of infertile seeds places the plant at risk of not being able to create viable seed banks to enable later re-colonisation due to disturbance and other uncontrolled factors. Despite the affects of climate, *Ammophila*

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ESTUARINE MANAGEMENT & MONITORING – REGIONAL PERSPECTIVE

Michelle White
Environment Southland

Estuaries play an important ecological role at the boundary between land and sea. They are valuable ecosystems, providing productive habitat for many species: as the breeding and/or feeding ground for many types of fish, birds and invertebrates, as well as home to a variety of plants. They are also highly valued by people as places to recreate and harvest food.

Estuaries act as 'sinks' for the catchments that feed them, receiving land generated sediments and contaminants; thereby having a significant influence on the health of our coastal waters.

The Southland region contains a number of notable estuaries, many of which form part of a network of shallow lagoons and estuaries with exceptional ornithological value.

Environment Southland began a long-term programme monitoring the health of key estuaries in the region in 2001. The programme aims to determine the estuaries' current health and to track changes over time, and to improve our knowledge of how estuary systems function. The next step is to integrate management of our natural resources, thereby taking a holistic look at the waterways upstream, the coastal areas downstream, as well as the estuaries themselves.

This presentation will discuss estuarine management and monitoring at the regional scale.

SUMMARY OF CONTROLLING INVASIVE *SPARTINA SPP*, THE NEW ZEALAND SUCCESS STORY

Graeme Miller
Ranger – Biodiversity, Department of Conservation, Southland

Information within this summary relates to work undertaken within Southland, New Zealand.

The Department of Conservation has been involved with the control of *Spartina* in Southland for the past 16 years and has had some significant successes in the fight against this invasive weed.

This information summarises the lead up to the Department's involvement, the trial work undertaken, the results achieved to the present and the plans for the future.

Planting of *Spartina* started in New River Estuary during the early 1930s to help reclaim parts of the estuary for industrial development. The initial plantings were of the species *Spartina x townsendii*, but these plantings did not prove very successful.

In 1947, plantings of the species *Spartina anglica* were undertaken. These plantings continued until 1954 and proved to be very successful.

In the following decades, the area covered by *Spartina* continued to increase, in an uncontrolled manner and spread to other estuary environments within Southland.

In the 1960s and early 1970s concern was first raised on the increasing spread of the infestations and the effect it was having on wading bird habitat.
In 1972, a committee was established to look at the Spartina issue, and with funding from the Invercargill City Council, trials were undertaken to try and control the *Spartina* spread.

Early work using the herbicide Tandex by spray application proved successful, but later work was less so, possibly due to silt build up on *Spartina* leaves reducing the effectiveness of the herbicide. A method of soil injection was developed, though successful, this was very hard, time intensive work. Successes achieved during these early control applications were due mainly to the dedication, perseverance and plain hard work of a few key people.

Aerial trials with the herbicides Herbex and Phytazol A were undertaken, but the consistency of the results was disappointing
Due to the restructuring of local authorities within Southland in the mid 1980s, fewer resources were allocated to the Spartina control programme. Infestations of *Spartina* again developed in an uncontrolled manner and so some of the earlier successes were lost

By the end of the late 1980s, it was estimated that infestations of *Spartina* within New River Estuary affected some 800ha, approximately 20% of the entire estuary area. In 1987, the newly formed Department of Conservation took responsibility for the control of *Spartina* within Southland.

These tools were:

- Firstly, a herbicide that was extremely successful in the harsh estuary environment.
- Next, a helicopter that could attack the vast meadows and
- Lastly, the Argo to control smaller areas and to follow up on the helicopter work.

The correct use of the right herbicide by the most appropriate method at the right time has had tremendous results, which have been able to be duplicated to all estuaries within Southland.

It was believed that the control and eradication of *Spartina* an impossible task 16 years ago. However, learning from previous lessons and developing some of the early pioneering work has led to a position across Southland where all infestations are now recorded at zero density

In order to achieve eradication of *Spartina,* it is crucial for an active surveillance programme to be undertaken, to continue to search for previously unrecorded infestations. At the present time, the *Spartina* meadows and patches have been eradicated from all estuaries within Southland – sparsely scattered individual plants are all that remain.

Where such plants are discovered, the appropriate control action needs to be taken at the appropriate time. The use of the Argo is now the mainstay of operations, being time and resource effective

In addition to present work, work will continue to be needed to monitor the effects on the estuary with the removal of the *Spartina*.

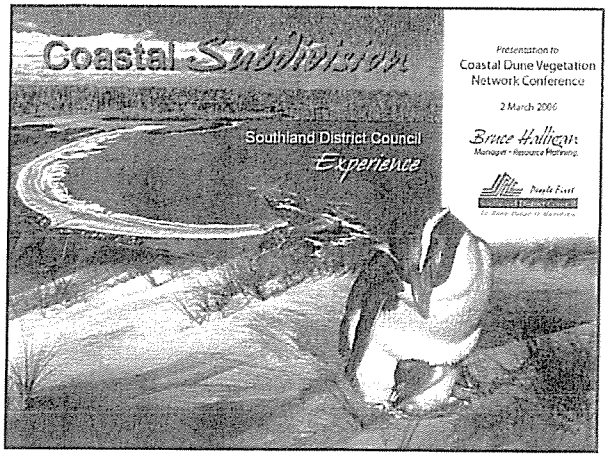
This has been a brief overview of the work that have been undertaken over the past 30 years to enable estuaries within Southland to be at a point close to eradication of *Spartina.* This would not have been achievable without the continuing support and cooperation of our partner organisations:

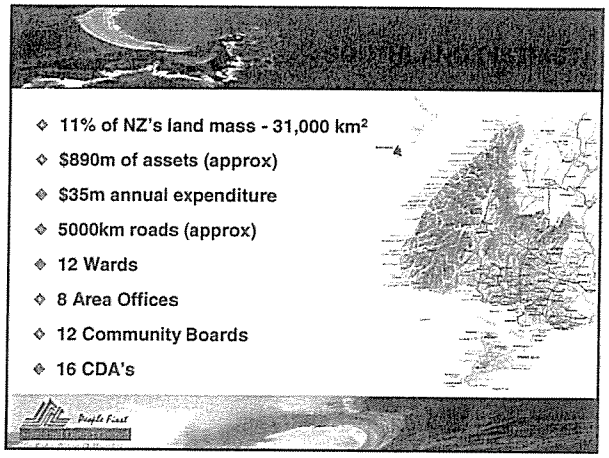
Environment Southland
Invercargill City Council
Dow AgroSciences

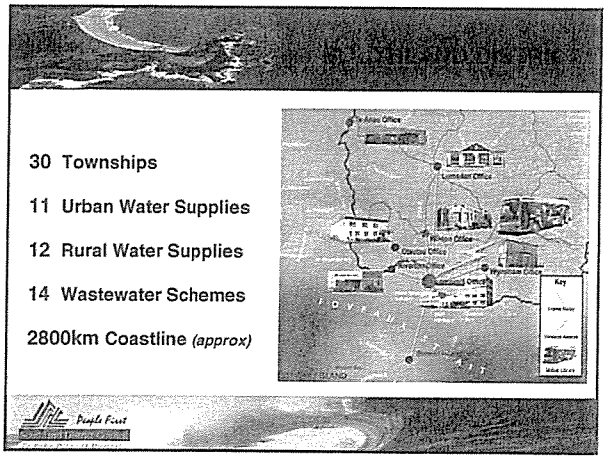
In addition, there have been a number of individuals who have given support, advice and assistance from the beginning of this programme. My thanks go to all who have been a part of this programme.

COASTAL SUB-DIVISIONS

Bruce Halligan
Southland District Council



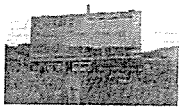


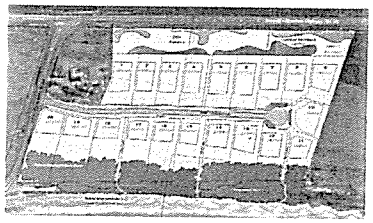


Increase in values in Riverton eg:

- 1995 - coastal residential property
  = $95,000.00
- 2005 - average residential property
  = $290,000.00

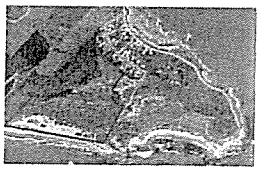
Significant increases in property values





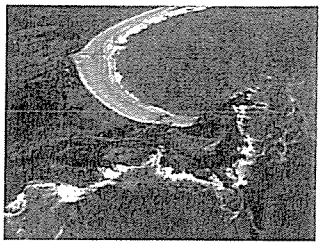
- Coastal bare land blocks selling for $250,000.00 plus in several locations

Coastal Development

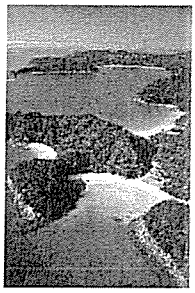


- Southland District Plan fully operative July 2001
- Coastal parts of Southland located in the "Coastal Resource Area" under the District Plan

- SDC is working with Environment Southland on a Coastal Study to identify areas suitable and unsuitable for development

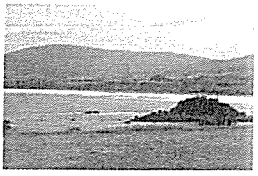


- Similar studies have been undertaken elsewhere in other locations which have significant coastal development pressure, such as Tasman District



Key Issues

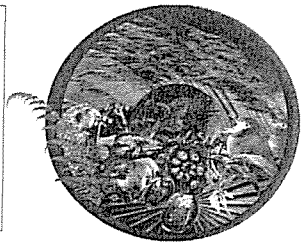
- Coastal Hazards – resistance from some *(not all)* developers to recommended planning horizons for hazard mitigation
- Maintenance and enhancement of indigenous vegetation



- Southland District is experiencing considerable coastal development pressure
- No sign of any slow down
- Could be seen as a "threat" to the coast

However also provides opportunities eg:

- Enhance public access
- Protect and enhance indigenous vegetation



Coastal Subdivision

Southland District Council Experience

Presentation to
Coastal Dune Vegetation Network Conference
2 March 2006

Bruce Hilligan
Manager - Resource Planning

COASTAL EROSION IN SOUTHLAND

Dallas Bradley
Environment Southland

Coastal Erosion in Southland

Dallas Bradley,
Hazard Mitigation Planner,
Environment Southland

environment SOUTHLAND

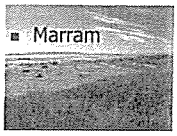
- Not really a big issue anywhere but a little issue almost everywhere! Not too little in some places though.
- No Omaha Beach, New Brighton Spit, Aotea Harbour or North Otago coast type situations but no room for complacency either.
- Erosion within harbours and estuaries and alongside tidal rivers is at least as much an issue as open coast.
- Roads and infrastructure more of an issue than private property.

So where is it all occurring?

- Stewart Island especially around Halfmoon and Horseshoe Bays but in remote places too eg the Gutter (heritage sites being eroded). – response is mainly rock walls or rock protection but one road abandoned and an alternative inland road constructed to Ringaringa. One timber wall. Shortage of rock in Stewart Island. Rock removed from beach to fix one problem has created another.
- Te Waewae Bay west of Waiau River – loss of road on coastal platform – response: abandon road & use beach or in some cases an alternate road.
- Orepuki Coast/ Monkey Island – not a big issue yet but the time will come
- Colac Bay – a hot spot (road and urupa eroding) – historic and recent rock protection. Good source of local rock.

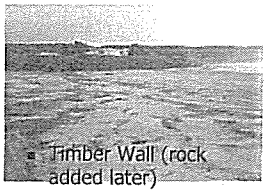
Protection Responses

- Marram



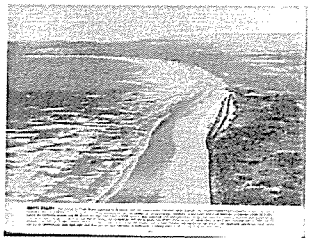
- Building Rubble
- pic

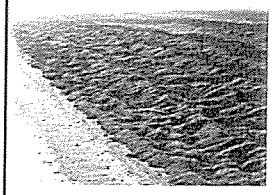
- Rock
- pic



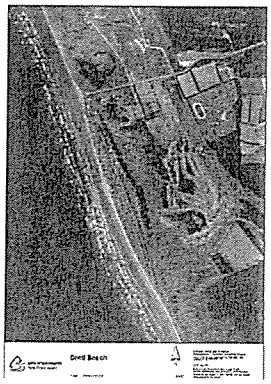
- Timber Wall (rock added later)

Oreti Beach Accretion



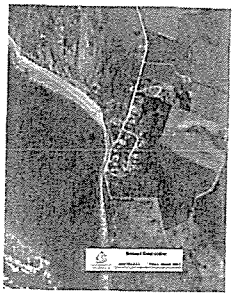


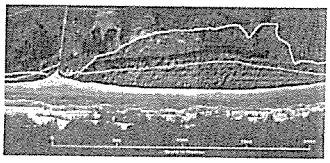
Oreti Beach Accretion



- Local Gov't Act 1974 Sec 315 (4) – "Every accretion to a road … along the mean high water mark of the sea … caused by the action …. Of the sea …. Shall form part of the road."

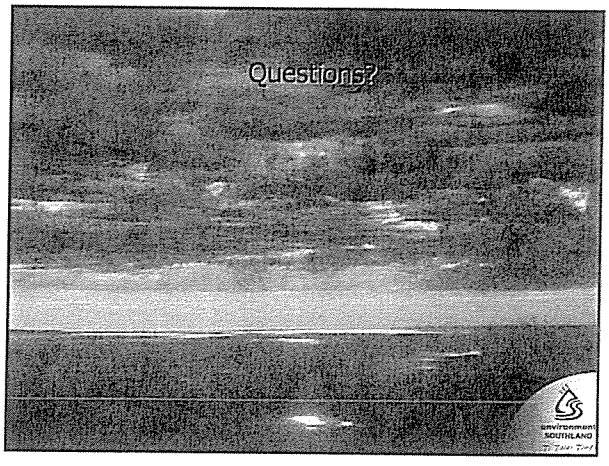
Environment Southland Aerial Photographs





Ongoing Management

- Setback distances set through the subdivision process – planning horizon varies a bit but we aim for 100 plus years.
- Maintenance of existing protection works.
- Construct new protection works on an as required basis.
- No one has retreated yet although the abandonment of the Oban Ringaringa road is similar.
- Some straight avoidance through the subdivision process.
- There are usually more (and often bigger) issues than coastal erosion, for example, marine inundation, natural character, landscape & amenity values and public access.



SOUTHERN STORMS, STORM SURGE & MARRAM GRASS INVASION

Mike Hilton & Nicola Henshaw
Department of Geography
University of Otago

Introduction

The geomorphic significance of storms and storm surge is generally understood, although relatively few storms from southern New Zealand have been described. Storm surge, comprising barometric set-up, wind set-up, wave set-up and wave run-up, is associated with episodes of dune scarping and coastal erosion. Storms that coincide with spring high tides and/or persist over several high tide cycles may be particularly destructive.

The ecological significance of storm surge is not so well appreciated. The current paper describes the southern storm of 18th September 2003. Secondly, it considers the potential for such events to disperse rhizomes of marram grass *(Ammophila arenaria)*. Marram grass is one of many foredune species that produces propagules (seed or rhizome) tolerant of saltwater emersion. These species are capable of floating significant distances. Developing an understanding of how these species disperse in New Zealand conditions is important in regions or areas where considerable resources have been dedicated to their eradication. We would also benefit from knowledge or where and how species such as *Euphorbia paralias* (European sea spurge), a serious invader of coastal dunes in Australia, might reach New Zealand.

Recent experiments at the University of Otago have established that marram grass rhizomes can remain viable for at least 40 days in sea-water. In southern New Zealand storms commonly scarp foredunes during surge conditions, washing large volumes of rhizome into the sea. The same storm, or a subsequent event, may deposit some of this rhizome above the usual high tide level. Storms are, therefore, an important process in the dispersal of marram grass and invasion of dune systems.

Storm surge – 18th September 2003

The storm surge event described here was the result of a cyclone tracking south of New Zealand, centered at latitude 53°S, 187°E, at noon (NZST) on the 18th September 2003. The centre of the cyclone had a pressure of 948 hPa. This system produced gale north to north-west winds, which persisted from the 17th to the 27th of September. Mean (10-minute average) hourly winds speeds of between 71 and 93.6 kmh^{-1} (21-26 ms^{-1}) persisted on the 18th at Puysegur Point (southwest Fiordland). Persistent mean wind speeds exceeding 122 kmh^{-1} (34ms^{-1}), were recorded at South West Cape at the southern tip of Stewart Island. Gusts reached 176 kmh^{-1}, just 3 kmh^{-1} below the station's all time record. Barometric pressure reached a minimum of 971.2 hPa at Puysegur Point at 3am on the 18th September and a minimum of 965.7 hPa at South West Cape at 6am on the 18th of September. Significant wave heights of 7-9m were observed west of Stewart Island by Topex-Poseidon and Jason-1 satellites on the morning of the 18th September.

largely eradicated from two of the three sand barriers/dune systems in the bay. The storm significantly eroded an area of untreated marram and distributed the rhizome throughout the bay. Much of the rhizome deposited above high water sprouted in the following months, giving rise to several hundred new plants. These have taken two years to eradicate using herbicide. This situation illustrates the potential for storm-forced processes to disperse large amounts of rhizome, in this case within a single embayment during a single event.

Storms may initiate marram grass dispersal well beyond the source area. We have found viable rhizome at Sealers Bay on Codfish (Whenua hou) Island, about 1.5km west of Stewart Island and several kilometres from the nearest major infestation. Marram grass has also established on beaches in Fiordland, most likely from sea-rafted rhizome. The implication of this work is that every site must be considered vulnerable to marram grass invasion, while substantial populations are present up-current of dune systems.

Caption - Storm wave run-up at Cavalier, Mason Bay, 4pm 18th September 2003 (photo: E. Ganley, DoC)

AN EXAMPLE OF COASTAL EROSION MANAGEMENT BY A SOUTHLAND COMMUNITY

Lyle Mason
South Catlins Coastal Landcare Group

A brief history of sand erosion on Lyle Mason's property at Otara (Waipapa Point), Southland.

For many years sand dunes were well covered with lupins and good grass covered areas between, offering good grazing and shelter for stock. Early 1990's saw lupins completely wiped out by lupin blight.

Small areas of sand started to shift, no major problems until El Nino year of 1997 when October till Christmas was almost one long, continual gale.

Before this, grass has always grown through shifted sand and stabilised the area before the next blow. With the sand now extending onto 20 acre's of the neighbour's property, windbreak cloth was put along the boundary fence. Over the next 12 months this was cleared of sand up to three times in places using a digger, tractor and trailer, and a truck. At the same time, on areas where there was no longer loose sand, ryecorn and Moata were direct drilled from January to May.

Also, Environment Southland brought a group of willing YMCA workers to plant marram grass on sand ridges still prone to blowing. These ridges had been reshaped using a bulldozer prior to planting. Some windbreaks were put in place using fallen trees, gathered from around the district.

Some areas were also capped with soil, with small areas fenced for shelter plantings, regressing with permanent pasture, and subdivision fencing, by 2001 the area was being used for grazing again.

Total area affected was approx. 100 acres.

Field Trip 1 –CDVN Conference 2006 Invercargill
Thursday, 2 March 2006
Invercargill – Fortrose – Otara – Waipapa Point

- Depart Invercargill at 12.00 Noon.

Everyone will be provided with a packed lunch and the buses will get out for the Toe Toes Bay and Waipapa Point on the South-East Coast; a distance of about 70 km

The route travels east following Highway 92, across the southern plains of Southland. To the South of the highway lies a vast area of peatland, which encompasses the Waituna Scientific Reserve, a designated wetland of International importance under the RAMSAR Convention. These wetlands are the most important bird habitats in Southland and are likewise nationally important for freshwater fish. Unique low-stature vegetation communities are also associated with the lagoon. The Waituna Landcare Group is active in promoting sustainable land management and maintaining water quality in the area.

From the small settlement of Gorge Road the route drops down into the Mataura River floodplain. The Mataura Catchment is the second largest in Southland (after the Waiau) and has a total area of 5,360 km^2. The length of the river is about 240 km. Environment Southland purchased some 2,300 ha of lower Mataura floodway land in the 1980's for flood protection schemes. The land is leased back to farmers. A number of bush reserves have been created in the lower floodway. These reserves contain riparian hardwood-podocarp vegetation and also the southern most beech (*Nothofagus spp*) in New Zealand.

The Mataura is famous as a brown trout fishery and the lower reaches are an important whitebait fishery. Much of the Titiroa wetland to the north of Toe Toes Harbour has been fenced off for conservation reserve. Good views of the Toe Toes Harbour and the Fortrose Spit can be seen as we reach the coast. Fortrose Spit is a key dune site with an intact and diverse array of invertebrates.

From Fortrose the route leaves the coast slightly and travels to Otara. The landforms here are underlain by hard sedimentary rocks of the Southland Syncline in contrast to the alluvium and sedimentary deposits of the plains. There are good views of Lake Vincent, a coastal lake formed between coastal sand deposits and the hard rock of the syncline.

TRAPPED BETWEEN FOREST AND SEA –COASTAL INSECTS

E. Edwards[1] & B. Patrick[2]
[1]Department of Conservation, Invercargill, eedwards@doc.govt.nz
[2]Otago Museum, Dunedin, brian.patrick@otagomuseum.govt.nz

The title implies a hostile environment in either forest or sea. This is perhaps a little overstated but few insects can complete their lifecycles on or in the sea and many are associated with alternative habitats to forest. Insect habitats on the New Zealand coastline and on the offshore islands face similar conservation management issues to those of indigenous vegetation. I draw on four invertebrate assemblage examples to value habitats/ecosystems that are undervalued when only plants are considered. These are:

1) Knobbled weevils of rocky coast
2) Back beach of Pig Island/Tihaka
3) Gravel ridges of Tiwai
4) Coastal bluff colluvium in Fiordland and elsewhere

We also value invertebrate communities from another perspective and reflect on recent knowledge about the presently rare case of dunes enriched by colonial seabirds:

5) Lost petrel colonies of Mason Bay: implications for invertebrates?

(Figure 1 & 2 ...)

1) Knobbled weevils of rocky coast

The knobbled weevil *Hadramphus stilbocarpae* has gone extinct in its Type Locality, an island to the south of Stewart Island and this occurred during a rat invasion in the 1960's. Similarly, the widespread occurrence of rodents on the South Island coastline has caused this large beetle's demise there too. However, small populations of this weevil persist on just a few offshore islands in Fiordland and the Subantarctic Snares Islands. These remaining sites are rat free. In Fiordland the weevil's host plant is a coastal native carrot –*Anisotome lyallii*. As the common name implies the plant has a thick root capable of hosting large fat beetle grubs. *A. lyalli* is confined to rocky or rubbly exposed coasts that are windswept and regularly doused in salt spray. Knowing this information, I visited Secretary Island which has over sixteen kilometres of exposed coast and no rats. The result was the discovery of the largest remaining stronghold for knobbled weevil. The value is in identifying not just intact vegetation but a large scale coastal ecosystem of high natural character. The lesson is the approach of considering not just plant and environment but also insect environment relationships. Maintaining the rodent free status is key to maintaining this site.

2) Back beach of Pig Island/Tihaka

This low twelve hectare island lies in Foveaux Strait and has a recent history of pastoralism. While it is dominated by exotic grasses and almost lacks woody vegetation, it stands out as quite unique in the region for two reasons. One it has sandy beaches rather than steep rocky coast typical of the region and two, rodents have never been established. I visited this island in December 1998. It was apparent that in a back beach area of only ~2 hectares, marram *Ammophila arenaria* was a new and aggressive coloniser. Open areas of storm rack and sand were being covered. A survey of invertebrates included finding typical beach sand inhabitants and three species of darkling beetle *Mimopeus opaculus, M.* sp. nr. *pascoei* and *Omedes*

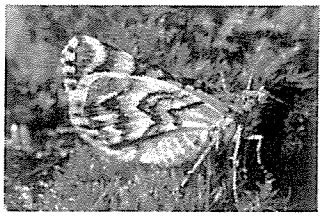



Figure 7. & Figure 8. *Notoreas* spp. day active moths on coastal sand daphnes *Pimelea* spp. similar to two undescribed moth species from Tiwai and from Mason Bay.

4) Coastal bluff colluvium in Fiordland and elsewhere

Some kinds of coastal cliffs have reasonable rates of erosion. Where there is opportunity for the sediments to accumulate or be loosely aggregated at the toe along with continual or episodic accretion of new material, then sparsely vegetated areas are the result. Vegetation elements are often interesting colonisers particularly in sites remote from exotic weed invasion and also because soil fertility will often be higher than in adjacent areas. These are conditions for unique assemblages of perhaps common but also more local invertebrates. An example from Chalky Island/Te Kakahu in Fiordland is the large flax weevil *Anagotis fairburni* which is locally common on the mountain flax *Phormium cookianum*. Locally on Chalky Island, flax is widespread but the weevil is most abundant where flax is growing on open colluvium. This flax occurs elsewhere in exposed coastal sites through out New Zealand as well as above bushline. The weevil has had a similar coastal and upland distribution but has declined much more where rodents are present.

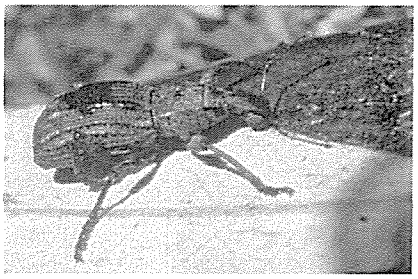
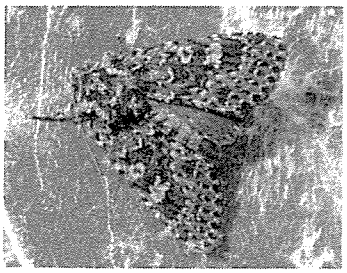



Figure 7. Flax weevil *Anagotus fairburni.* Figure 8. Coastal daphne moth *Meterana pictula* reaches its southern limit on Fiordland coastal bluffs

On tallus in the north of Fiordland at May Hills, is a local population of the striking noctuid moth *Meterana pictula* with larvae on daphne *Pimelea prostrata*. Local populations of this moth and it's host plant are also confined to small areas on coastal cliffs in areas of pavements or colluvial rubble along the South Island West Coast. It is locally extinct from the North Island coastline but a remnant and outlying population occurs in the Mt Ruapehu alpine zone. The pattern is repeated for other moths and beetles hosted on New Zealand's coastal bluff plants. In addition to the flax and daphne, examples include a large weevil on speargrass *Aciphylla squarrosa*, moth on creeping liane *Calystegia soldanella*, moth on bluff daisy *Celmisia lindsayi*, moth on coastal rock grass *Poa astonii*, moth on coastal native aniseed *Gingidia grisea* and other examples.

5) Lost petrel colonies of Mason Bay: implications for invertebrates?

The extraordinary functional role of titi/muttonbirds *Puffinus griseus* adding nutrients to breeding grounds can be observed on many islands outlying Stewart Island/Rakiura and also as residual populations on windswept coastal headlands from Otago Peninsula to

biomes over a period quite possibly extending well beyond Holocene time (11000 years BP).

5) Removal of rodents from some coastal dunes would enhance their natural value for both indigenous invertebrates and vegetation
6) Where forest cover is removed but indigenous non-forest vegetation is found on coasts, it should often be viewed as a very old association rather than recent and seral. And the invertebrate associations will likely be of at least local significance. Many coastal bluff systems have this character.
7) The New Zealand coastline harbours a number of sites that have an alpine-like character in terms of flora and fauna. Otago and southland has a disproportionate number of these and they deserve better recognition and protection.
8) Recent analyses have shown coastal dune and other ecosystems have lost areas of nutrient enrichment with their loss of breeding populations of marine birds and marine mammals. The loss of derived ecosystem function represents a loss of biodiversity. Where restoration is a goal in such sites we recommend a whole ecosystem approach that includes thinking about nutrient enrichment or limitation consequences for the site fauna and flora.

Acknowledgements

The authors acknowledge useful discussion, company and review by Brian Rance. Thanks to Department of Conservation and Otago Museum for ongoing support. Images: Department of Conservation or the authors.

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THREATENED PLANTS AND PLANT COMMUNITIES OF SOUTHERN NEW ZEALAND DUNES

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Introduction

This presentation is a celebration of the Southland coast and is intended to give a glimpse of some of the threatened plants and special dune systems found. Southland has an extensive and very diverse coastline. Mainland Southland/Fiordland (excluding islands) has c. 1860 kilometres of coast, while Stewart Island (excluding islands) has another c. 681km of coast. The southern coastline includes fiords, sounds and estuaries, and has cliffs, rocky shore, gravel and sand beaches. The coast includes parts of two national parks (Fiordland and Rakiura) and one RAMSAR Wetland of International Importance (Waituna Wetland Scientific Reserve)

Dune systems are a special part of the southern coastal diversity. The sand dune and beach vegetation inventory of the South Island and Stewart Island (Johnson, 1992) included 333 coastal sites, with 78 in Southland. Of the 30 sites identified as nationally important, 19 are found here, including the three ranked most important! The dune systems of southern Southland contain several threatened ecosystems including dune communities, dune slacks/wetlands, coastal lakes, *Raoulia* cushionfield, stonefields, totara forest and coastal turfs.

Therefore Southern New Zealand is an important site for sand dunes conservation. Reasons for the high numbers of dunes of national importance in southern New Zealand include: their naturalness (intact ecological functioning, lack of weeds or other modification); their natural setting with intact sequences from the coast into forest; the diversity of dune plant associations; the diversity of flora (including threatened and endemic plants).

Threatened plants of southern Southland

The coast bioclimatic zone and in particular the dune ecosystem is an important habitat for threatened plants (de Lange et. al. 2004). There are at least 46 threatened plants found along the coast of Southland. This includes 31 species found within dune systems (though not all are dune species). Of these three are "Acutely threatened" are a further 14 are "Chronically threatened", the remainder being classified as "At Risk".
Southland is a national stronghold for several threatened plants including sand spurge (*Euphorbia glauca*, National status – Serious decline) pingao (*Desmoschoenus spiralis*, National status – Gradual decline), sand tussock (*Austrofestuca littoralis*, National status – Gradual decline), and sand iris (*Libertia peregrinans*, National status – Gradual decline). A feature of the sand dune and coastal flora of Southland is the number of endemic taxa, with at least 17 taxa restricted to southern New Zealand. Some of these taxa are confined to on Stewart Island, some on the Stewart Island/Foveaux Strait coast and while extend west to Fiordland or east to the Catlins. These species include *Gunnera hamiltonii* (National status – Nationally Critical), *Mazus arenarius* (National status – Gradual decline), *Pimelea lyallii* (National status – Gradual decline), *Acaena microphylla* var. *pauciglochidiata* (National status – Range Restricted), shore carrot (*Anisotome lyallii* (National status – Range Restricted), *Craspedia robusta* var. *pedicellata* (National status – Range Restricted), *Euphrasia repens* (National status – Range Restricted), *Gingidia flabellata* (National status – Range Restricted),

The Stewart Island coast is also largely in a natural setting, with much included within Rakiura National Park. Some dunes systems have a relatively intact vegetation cover while others are now dominated by marram grass. This area contains nine sites considered by Johnson (1992) to be nationally important. These are confined to the western and northern Stewart Island (including Sealers beach Whenua Hou/Codfish Island).

Case study – Masons Bay

Masons Bay is an outstanding dune system, being the largest dune in Southland. It contains dramatic and diverse sand dune landscapes. The diversity of plant species and habitats is exceptional. The sequences through the dune into red tussockland, shrubland, wetland and forest are of significance. Masons Bay is the most important single dune system for threatened plant conservation in Southland. It contains at least 17 threatened plant species including: the only New Zealand dune site for *Puccinellia raroflorens* (status – Nationally Critical); the only Southland sites of *Crassula peduncularis* (status – Nationally Endangered) and *Luzula celata* (status – Serious Decline); and one of only seven original sites of *Gunnera hamiltonii*. The major conservation requirement is to continue the marram grass control programme.

The southern Southland coast is generally backed by a modified landscape, with a predominately agricultural land use. Most dunes are dominated by marram grass, with few areas of natural dune vegetation remaining. This modification is reflected with only one site (Toetoes Beach) considered by Johnson (1992) to be nationally important. However two other sites retain values that also warrant national importance.

Case study – Fortrose Spit

Fortrose Spit is a sand spit located between Toetoes beach and the Mataura River. The site retains one of few remaining populations of pingao and sand tussock on the Southern coast. The site also contains an important population of *Ranunculus recens*. Establishment of sand spurge and *Gunnera hamiltonii* has been attempted, with limited success. It contains the most extensive *Raoulia* cushionfield known on the Southland coast. The major conservation requirement is to continue the marram grass control programme in association with pingao restoration. Another weed of major concern is stone crop (*Sedum acre*) with is invading the *Raoulia* cushionfield. Other management issues include rabbit control and management of off road vehicles.

Summary

The major management undertaken on dune systems is weed control. Coastal areas form a major component of the weed control programme undertaken by the Department of Conservation within Southland Conservancy. With major works undertaken on dunes, estuaries and coastal wetlands. The entire Fiordland/Waitutu coast is subject to a weed control programme involving annual work targeting marram grass, gorse and other coastal weeds. Stewart Island also has a marram eradication programme underway (this has been the subject of a separate paper at this conference). Weed control on dune systems on the southern Southland coast is largely confined to the Three Sisters and Fortrose Spit sites that retain the best dune vegetation.

There is currently limited community driven dune restoration work underway in Southland. Most of the restoration work undertaken concentrates on weed control, which in some sites is associated with planting pingao and other dune species. There are several dune systems along the Southland coast that are in Crown or local authority ownership. Some of these have linkages with forest and other fringing native vegetation

BIRD SPECIES IN COASTAL AREAS

Lloyd Esler

This talk is about Southland coastal birds. I would like to have done it on dune birds but that would have been a short talk. There are no birds confined to duneland and probably none for which dunes are the most important feeding area, but there are four species which make good use of it. The first is the kiwi - the Stewart Island brown kiwi - whose footprints and probe holes are numerous in the dunes of Mason Bay. These dunes are massive, consolidated, free of mustelids and dissected by deep gullies of forest and scrub. In these gullies, in the wet hollows between the dunes and along the beach the kiwi feed on amphipods, insect larvae and worms. Next is the swallow, established in Southland only in the last few decades and still expanding its range. More and more frequently we see swallows, individually or as a small 'flight', working over the dunes and sandy shore. They catch flying insects, which in this habitat will be flies, beetles, moths and a few bugs. Black-fronted terns do the same. They nest in small colonies on Southland river beds but many spend time along the coast and they are often seen hawking flying insects, sometimes wheeling around as a flock in an area of concentrated insect activity. I imagine that this is after a hatch of beetles such as grassgrubs, perhaps flies attracted to a carcass or after a mass emergence of cicadas. On two occasions I have seen gulls feeding on cicadas - once on Motuara Island where black-backed gulls were picking large noisy cicadas from the kanuka canopy and on Mason Bay at Christmas where red-billed gulls were stooping to snatch up small cicadas of which there was a mass emergence.

So much for the insect-eaters, but I should mention grey warblers, brown creepers and silvereyes all of which I have found in lupin and elder on established dunes where they are feeding on caterpillars and other insects and spiders. The other dune species are redpolls, goldfinches and chaffinches - seed eaters which avail themselves of the seeds of catsear, thistles, pasture grasses, sea kale and the berries of prostrate coprosmas, *Pratia* and others in the dune hollows. To complete the dune list there is the New Zealand dotterel and banded dotterel which camp on the dune flats at Mason Bay. We can speculate about the place of the moa as a dune bird. Certainly their bones, eggshells and gizzard stone are found in dunes but perhaps there were forested dunes from which the vegetation has been lost.

Turning our attention to the sandy shore birds we have a list of over 50 for Oreti Beach but most of these are casualties which have washed ashore - dead or dying. Some have just stopped off for a rest and a few are strays, well outside their normal range. The most remarkable of these was an emperor penguin which came ashore here in 1967. It must have been kidnapped in Antarctica and released offshore when it showed signs of heat stress. We have four seasonal patterns in bird wrecks on Oreti Beach. First is the regular wash-up of muttonbirds which have just left their burrows around Stewart Island in late April and early May. Second is a wreck of juvenile Bullers mollyhawks which have just departed their nests on the Snares and Solanders and come ashore in September. Many of these are still alive and some get rehabilitated by DoC. At that time of year they turn up on farmland all around Southland especially if there have been strong winds. The third annual event is a wreck of short-tailed shearwaters in November and the fourth is an irruption of Antarctic birds which come north in August and September to escape the worst of the Antarctic winter. These are the fulmar, cape pigeon, Antarctic prion, Kerguelen petrel, blue petrel and Antarctic

What changes are likely in the future? The black-billed gull population is falling steeply because of their lack of breeding success on our river beds, no doubt this will be aggravated by the *Didymo* infestation, and their numbers will continue to decline. Reef herons will disappear apart from in Fiordland; spoonbills and swallows will increase and the waders will continue to come as long as their feeding grounds along their migration route in Asia are preserved and they don't become victims of the fight against bird flu.

Field Trip 2 –CDVN Conference 2006 Invercargill
Friday, 3 March 2006
Colac Bay – Wakaputa and Monkey Island

- Buses depart 10.00 am

This trip heads westward along state highway 99, across the fertile southern plains towards Riverton.

We cross the Oreti River at Wallacetown. The Oreti River Catchment is the third largest in Southland. Normal flows at the Wallacetown Bridge are around 30 cumecs. The highest flow totals 1,370 cumecs (1980).

Some 30 km from Invercargill is Riverton. Riverton sits at the mouth of the Jacobs River Estuary, which is fed by both the Aparima and Pourakino rivers. The estuary supports large numbers of resident and migratory waders. The Riverton Estuary Care Group is very active and has developed an extensive flax wetland on the eastern side of estuary approaching Riverton.

Across the bridge, landscape is dominated by the hard rocks of the Howell Hills, formed by basaltic to rhyolitic lavas. Remnant coastal podocarp forest occurs across the hills and community involvement in pest plant and pest animal control is high.

The route skirts the western end of the Howell Hills and drops into Tihaka and Colac Bay. There are great views of the rocky headlands and sandy beaches. Foveaux Strait, Centre Island, Whenua Hou (Codfish Island) and Stewart Island are all laid out on a clear day. This stunning coastline has resulted in a number of subdivision proposals as the desire to own coastal property and have a sea-view is gaining momentum.

We will be stopping in Colac Bay to look at and discuss some of the issues surrounding coastal subdivisions.

From Colac Bay the trip continues westward around Lake George (an important wildlife reserve), past the Round Hill gold workings to Kawakaputa Bay. This bay lies between two hard rock headlands, Oraka Point and Wakaputa Point. The headlands and the range of hills to the north – the Longwoods – are formed from volcanic lavas and ashes and date from the Permian.

At Kawakaputa we will hear about the parabolic dunes oriented at an acute angle to the adjacent shoreline. These dune landforms are of national

POSTER ABSTRACTS

Poster Abstract

TREE LUPIN (*LUPINUS ARBOREUS*) INVASION, KAITORETE SPIT DUNES, CANTERBURY

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The conservation values of the dunes of Kaitorete Spit are outstanding. The dunes are of national significance, with a score of 18 out of 20 in the Sand Dune and Beach Vegetation Inventory (Johnson, 1992). Large populations of *Desmoschoenus spiralis* (pikao) and other native dune species, some endemic to the Spit, are present. Levels of exotic plant invasion have, until recently, been reported as relatively low. Marram grass (*Ammophila arenaria*), in particular, has not become the dominant vegetation, as it has in most of the dune systems of southern New Zealand. Unfortunately, tree lupin occupies a large section of the dunes and it is spreading rapidly.

Tree lupin was observed to be widespread but in decline on Kaitorete Spit during the 1980s (Molloy *et al.*, 1991). The Department of Conservation have recently become concerned that the species is resurgent and arranged a collaborative study with the University of Otago (Spatial Research Theme). A systematic GPS survey of five exotic plants, including tree lupin, was conducted within the dunes of Kaitorete Spit in November 2005. The historic distribution of tree lupin was derived from an analysis of vertical, low level, 1989 and 1998 colour aerial photographs. The resulting maps of tree lupin were prepared and compared using ARC-GIS.

Tree lupin currently covers 20% of the total dune system on Kaitorete Spit. The main infestation extends alongshore about 7km and is 250 to 400m wide (Figure 1). Within this area tree lupin occupies virtually all the available dune habitat. Isolated plants of tree lupin occupy areas of dune to the east (3km) and west (1km) of this area. Two significant areas of tree lupin also occur at Birdlings Flat and near the solitary crib at the western end of the spit. Only an 8km length of coast remains completely free of tree lupin.

The area of tree lupin has expanded exponentially since 1989, when it occupied 17.4909ha. By 1998 it occupied 27.7088ha and by November 2005 it occupied 92.999ha. Unless this species is controlled tree lupin is likely to cover the entire dune system of Kaitorete Spit by 2030.

Tree lupin is rapidly destroying the dune habitat and conservation values of Kaitorete Spit. Future management of tree lupin will demand a large scale, sustained eradication programme. We recommend immediate eradication of all tree lupin west and east of the main infestation, including the populations adjoining Birdlings Flat needs to occur. The seed bank in these areas will not yet be at capacity, due to the young age of the associated tree lupin. The recommended strategy is to first eradicate tree lupin where it is sparse and/or immature, which will de facto delineate areas that will be kept free of tree lupin and other exotic species while techniques are developed to deal with the main infestations. There is relatively little to be gained in the short term by attempting to eradicate areas of dense tree lupin – where the seed bank is already saturated. Further research is required to identify the most effective herbicides and to learn more of the ecology of tree lupin.

Poster Abstract

THE GLOBAL SPREAD OF SAND-COLONISING PLANTS AND THE DEGRADATION OF TEMPERATE DUNE SYSTEMS

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The ecology of the world's temperate coastal sand dunes is threatened by the human-related dispersal of coastal dune plants. Movement of species has occurred within and between the northern and southern hemispheres. This is a global issue, because of the number, extent and ecological consequences of these invasions. Case studies are presented from two countries, Australia and New Zealand. These demonstrate that (i) the transgressive dune systems of Australasia are vulnerable to exotic plant incursions; (ii) exotic species threaten the natural dynamism and ecology of dune systems; (iii) there is low public and government recognition of the problem; and (iv) there is currently little active control or management of these species.

The foredune communities of Australia and New Zealand are dominated by just three species - two grasses (*Spinifex sericeus* and *Austrofestuca littoralis*) and, in New Zealand, a sedge (*Desmoschoenus spiralis*). A greater range of species, many of them specialist dune species, occurs in back-dune environments, however, the vegetation cover and total biomass in active, transgressive dune systems is often low. There is widespread evidence of episodic transgressive dune development during the late-Holocene, probably related to climatic variations and foredune vegetation stress. This process is closely linked to habitat and landscape diversity.

Australasian dune systems have been greatly modified over the last 100 years, as a result of the introduction of European strandline and foredune species. Marram grass (*Ammophila arenaria*) and European Sea Rocket (*Cakile maritima*) are widespread in southern Australia and New Zealand. Sea Wheat-grass (*Thinopyrum junceiforme*) and Sea Spurge (*Euphorbia paralias*) occur across the south coast of Australia. Three South African species, Bitou Bush (*Chrysanthemoides monilifera*), Capeweed (*Arctotheca populifolia*), and Pyp Grass (*Ehrharta villosa* var. *maxima*) are also naturalised and spreading in temperate southern Australia. These species are invasive because the vegetation cover of dune systems in Australasia is low, there is a lack of competition from other plants and a dearth of associated parasites. Individually or collectively, these invasive species have been shown to displace native flora and fauna, provide habitat for other introduced species, change landscapes and establish new dune forms. Over longer time scales, 10^2-10^3 years, they may inhibit dune dynamics, dune system development and dune biodiversity.

The above species established in Australasia throughout the 20th century. Most were deliberately introduced with no assessment of their long-term ecological impact. Control or eradication operations have been attempted or are underway at some sites of significant conservation value. Most of the above species disperse by marine-rafted rhizome or seed and management is only effective when carefully coordinated and consistently funded. Inadequate funding stems from low levels of understanding of the natural character of coastal dunes, albeit the control of some species by community groups has proved highly effective. Safeguarding the ecology of coastal dunes requires

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sit down – eating lunch. Weds.

PROPOSED AGENDA COASTAL DUNE VEGETATION NETWORK 2005 CONFERENCE (23RD February to 25th February 2005)

Venue: Forum North Conference Centre

Tues. Night – Public mtg.

Wednesday 23rd February

7:00 am	Display set up (can commence pm Tuesday 22nd)
8.30-10.00am	Registration
9.45-10.15am	Morning tea
10.15 -11.00am	Formal Opening Welcome to the Region CDVN (current projects/highlights)
11.00- 12.15pm	Technical session 1 (4 speakers) 5 min question time
12.15- 1.15	Lunch
1.15- 3.00	Technical session 2 (5 speakers) 5 min question time
3.00- 3.30	Afternoon tea
3.30- 5.30pm	Technical session 3 (5 speakers) 5 min question time
5.45pm	Cocktails (Optional trip to Limestone island, Whangarei Harbour)

Catering

Thursday 24th February 2005

8.00am	CDVN AGM
9.00-10.30	Regional Roundup
10.30-11.00	Buses for Whangarei Heads, departing Forum North
11.45- 1.00	Oceans Beach (lunch at Oceans?)
1.00- 5.30	Tutukaka Coast Matapouri.
7.00pm	Pre Dinner drinks Gybes Town Basin
7.30pm	Conference Dinner (Guest speaker?)

lunch @ – surf club if wet. or Tauranga

Woolleys Bay

Friday 25th February 2005

Field Trip

8.00am	Depart from Forum North
8.45-9.30	Ruakaka Surf Club
9.30- 12.30pm	Uretiti-Bream Bay –Waipu (lunch at Waipu Surf Club)
12.30-3.30pm	Mangawhai Heads -visit nursery, Mangawhai Spit
3.30pm	Drive back to Whangarei

Catering

Catering

Saturday 26th-Sunday 27th Pouto Trip

Catering.