DUNE RESTORATION TRUST OF NEW ZEALAND

ADAPTING PRODUCTIVE COASTAL LANDSCAPES TO CLIMATE CHANGE

A SCOPING STUDY

Jim Dahm and David Bergin

2011

Keeping our Dunes ALIVE

DUNE RESTORATION TRUST OF NEW ZEALAND

The Dune Restoration Trust of New Zealand (Dunes Trust) is an independent forum, developed to increase understanding of the importance of sand dunes and their native plants and animals.

The mission of the Dunes Trust is:

"To see the majority of New Zealand dunes restored and sustainably managed using indigenous species by 2050".

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Join the Trust and help care for New Zealand's iconic beaches and sand dunes. There are several categories of membership available including research partnerships and sponsorship opportunities.

We look forward to your support.

For more information about the Trust please contact:

Dune Restoration Trust of New Zealand

www.dunestrust.org.nz

Email: info@dunestrust.org.nz

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Report prepared for the Dune Restoration Trust of New Zealand by Jim Dahm, Eco Nomos, and David Bergin, Environmental Restoration Ltd.
Jointly funded by the Ministry of Agriculture and Forestry's Sustainable Farming Fund and the Dune Restoration Trust of New Zealand

DUNE RESTORATION TRUST OF NEW ZEALAND

Project Number LC09/008

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INTRODUCTION

Coastal lowlands in most regions throughout NZ are among our most intensively farmed and forested lands, often integrated with rural service communities that are experiencing shrinking populations and associated issues with maintaining schools and other services. Productive landscapes in these coastal margins often interface with critical coastal ecosystems such as coastal and estuarine wetlands, coastal dunelands, and coastal lowland forests.

At present, economic pressures often result in the productive land uses encroaching significantly on the coastal ecosystems and coming into increasing conflict with environmental values. Work with estuarine wetlands and coastal dunelands, two of the environments most significantly impacted, indicates that farmers are often acutely aware of the environmental issues but feel powerless to address them - as withdrawing from these areas would significantly affect the economics of their farms. There is also considerable concern in productive sectors that environmental regulation will unsympathetically resolve the conflicts in favour of environmental values and without adequate regard to productive interests, with serious consequences for many landowners. This in turn often leads to considerable resistance and antagonism towards environmental concerns, despite the fact that the individual farmers are often, at heart, quite sympathetic to these values.

These "coastal squeeze" conflicts will become even more significant with projected climate change and ongoing pressure for intensification of land use. For instance, the Ministry for Environment (MfE) July 2008 Guidance Manual "Coastal Hazards and Climate Change" recommends adoption of a base sea level rise allowance of 0.5m by 2100 and consideration of the consequences of a rise of at least 0.8m – with allowance for 10mm/yr rise beyond 2100 for 2-3 centuries or more. Sea level rise of this magnitude will result in more frequent and more serious flooding of low-lying coastal margins and considerably aggravate erosion of sandy ecosystems with finite sand reserves.

There is a critical need to develop adaptation strategies that enable both productive land uses (and associated communities) and critical ecosystems to be better integrated and sustained in coastal margin environments, and to build resilience that will enable the land uses to adjust with the projected effects of climate change.

This scoping study focussed on working with landowners interfacing with coastal dunelands and coastal wetlands to clarify the various related issues, particularly from the land user perspective; and to identify areas of best existing practice and other opportunities to enable productive use along our coasts to better integrate with critical coastal systems; particularly opportunities that help build resilience to cope with the effects of climate change.

OBJECTIVES

The particular objectives of the study were to:

- Identify and scope with productive land users opportunities and adaptive strategies to better integrate and to sustain both productive land uses and critical coastal ecosystems in the face of projected climate change; and
- Identify further work required to develop and implement these opportunities and adaptive strategies (including best practice guidelines for productive land users).

It is envisaged that the scoping study will identify good landuse practices and opportunities that can then be further explored through more detailed work to develop best practice guidelines.

SCOPE OF PROJECT

This preliminary study has largely focussed on coastal areas subject to farming landuse as it is here that conflicts between productive land uses and critical coastal ecosystems are considered to be most frequent. In particular, coastal dunelands, and coastal and estuarine wetlands are under substantial pressure where these ecosystems are adjacent to pastoral farming have already undergone significant losses, degradation and modification.

There are significant areas of production exotic forestry along parts of the coastline and management of particularly the seaward edge of exotic forestry is discussed. However, it is the ongoing pressures related to intensification of pastoral land use in recent years, such as dairying, that pose significant threats to the viability of both the productive land uses and critical coastal ecosystems, and especially in the face of predicted effects of climate change.

METHODS

A brief review of existing information on land management issues and opportunities associated with pastoral farming and forestry activities on coastal lands around New Zealand was undertaken. This focussed on dunelands and estuarine wetlands and was largely undertaken by phone and email and included a search of relevant literature.

Site visits and discussions with farmers of coastal properties near Dargaville and Whangarei in Northland and in Cable Bay (near Nelson) and near Collingwood (Golden Bay) were completed. The farms included ship and beef, forestry and dairying land uses. All properties were adjacent to open coast and/or included estuarine margins along their boundaries.

Additional site visits and discussions with productive land users were conducted in association with separately funded projects including sites in the Waikato Region (various Coromandel and western Waikato coastal sites), Horowhenua (site near Levin), Canterbury, South Canterbury, and Southland. These various sites included pastoral farming (dairying; sheep and beef) and exotic production forestry land uses. A wide variety of discussions were held with management agency staff and other parties (e.g. Land Care Trust; environmental groups) including Northland, Waikato, Wellington and Canterbury regions.

This report briefly identifies the key issues regarding productive lands at representative coastal sites, elaborates on the opportunities to better integrate and sustain productive land uses with critical coastal ecosystems, and provides directions for further work to explore to develop these opportunities.

RESULTS

Productive Land Use and Coastal Dunelands

Coastal dunelands are among the most significantly modified and degraded of New Zealand's major ecosystems and have been identified as national priority for protection and restoration. For instance most remnant natural duneland areas are truncated ecosystems in which only the most seaward of the original successional vegetation communities remain. Duneland forest is rare and typically consists only of isolated and very small remnants. Full dune vegetation successions through to dune forest now remain at only a few very rare sites (e.g. 2 sites along the entire east coast of New Zealand). Continued encroachment and modification (including weed invasion and loss of some palatable species to pests such as rabbits) are typically resulting in ongoing loss and degradation of remnant natural areas.

Productive land use is a primary cause of historic losses and ongoing pressures. In addition, emphasis on the use of exotic species (e.g. marram; nitrogen-fixing species such as lupin and *Acacia sophorae*) by productive land users has given rise to significant weed problems on dunelands. Pastoral land uses also often provide habitat for rabbits which can have a significant effect on palatable native dune species in adjacent remnants.

Publicly-owned coastal lands

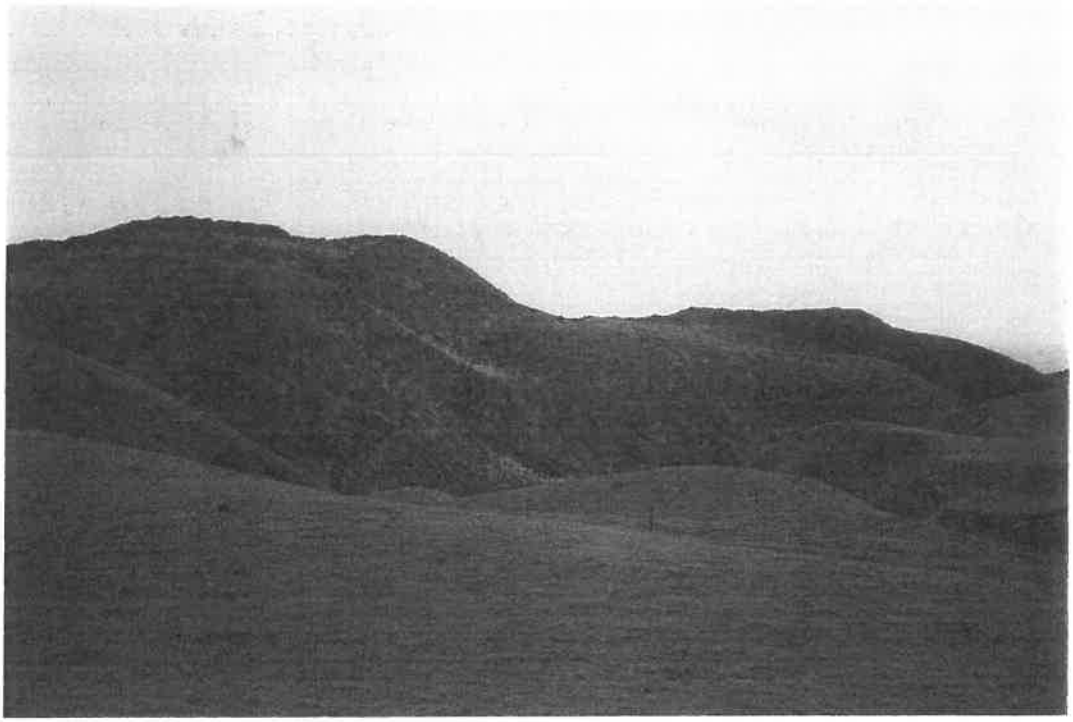
Similarly, poor management of public-owned dunelands can result in a wide range of issues for productive land use. A significant concern for pastoral land use was poor control of weeds – with examples where control of gorse and other weeds on the farms was both complicated and made more expensive by inadequate controls on the adjacent natural dunelands. One Northland dairy farmer we spoke to was attempting to gain a grazing lease of adjacent natural dunelands (in this case, DoC estate), in large part simply to enable better control of weeds! Experience at other dune sites with grazing leases indicates this would likely result in complete loss of the natural remnant vegetation.

Pastoral and forestry land users often also expressed significant concerns over inadequately managed human use (largely recreational) on the natural dunelands – with concerns including wind drift, mutual fences and (particularly forest owners) fires. Off-road recreational vehicles, particularly motorbikes, were a primary among these concerns – in many cases vehicles stray onto adjacent private dunelands and in some cases have even cut fences to do so.

Most productive land users spoken to were aware of the need to manage "sand country" carefully to avoid sand destabilisation but were typically unaware of the environmental degradation of coastal duneland ecosystems, i.e. an awareness related primarily to issues related to productive use rather than ecological health. Some productive land users adjacent to dune remnants on public land noted (usually somewhat wryly!) that current management often leads to the perception of these areas as wastelands rather than important ecological remnants!

Impacts of climate change

Potential climate change impacts vary with location but may include significant retreat of sandy shorelines, narrowing remnant natural areas and also reducing protective natural buffers seaward of productive land. In addition, increased winds predicted for many west coast areas have the potential, in concert with human pressure, to aggravate sand destabilisation. The greater westerly wind flow may also increase the level of wind and salt shelter protection required for many productive land uses along this coast. Decreased wind flows and rainfall on the east coast may also impact dune ecosystems.



Most landowners are well aware of the need to fence off fragile dune hills from grazing stock such as this award winning dry stock farm north of Dargaville, Northland.

Exotic production forestry

Exotic production forestry is established along some of our most exposed coastal margins especially along the west coast of the North Island and provides shelter and prevents sand erosion for both forestry and farming landuses landward. Production pine forests on dunes typically require a sacrificial forest margin along the seaward edge to buffer wind and salt. At present, these buffers are pine or other exotic species (e.g. macrocarpa). With appropriate partnerships, there is considerable potential to replace or transition from these exotic buffers to a native dune succession, including forest. Such successions, among the rarest ecosystem remnants in New Zealand, have much lower fire risks, would be sustainable over centuries and would evolve with climate change.

Many forest owners also make extensive use of marram grass and other exotic species on their dunes. There is considerable potential, with appropriate partnerships and information, to move towards the use of more diverse and sustainable native communities – with advantages for both productive land use and dune ecosystems. With such work, it is also likely that use of aggressive weedy species and existing areas of such vegetation can be significantly reduced over time.

Exotic production forestry is established along some of our most exposed coastal margins especially along the west coast of the North Island. Opportunities exist for transitioning the often seaward margin of these forests to zones of indigenous biodiversity to provide resilient communities that are likely to sustainable with impacts of climate change.

Opportunities for integration

Discussions with landowners suggest there is significant opportunity to better integrate productive land use and ecology on coastal dunelands with potential benefits for productive land use, restoration of seriously degraded coastal duneland ecosystems and enhanced resilience in the face of climate change impacts. In particular, there is significant potential for the more seaward and exposed areas of productive land and/or public land to seaward where planting and restoration of native dune sequences (including forest) can have significant value as shelter for productive uses further landward.

The importance of wind and salt shelter was emphasized by several landowners. For instance, a Southland farmer on dunelands spoke of pasture "yellowing off" overnight in response to severe southwest winds bringing in salt. These benefits are relevant in most open coast settings, but particularly along exposed coasts (e.g. western coasts). Natural ecosystems in these areas will evolve and adapt to climate change – ensuring a high level of resilience for the buffers and land uses to landward.

The various potential opportunities/solutions appear to have strong potential for uptake with appropriate implementation frameworks.

Many landowners recognised the importance of providing shelter for pastoral farming from the prevailing onshore winds along many parts of our coastline. Protection and enhancement of indigenous forest remnants and the use of native dune vegetation sequences can provide substantial shelter benefits for both animal and plant production.

Partnerships

Building appropriate partnerships and increased co-operation among different parties was seen as the most critical aspect to developing opportunities. Productive land users are open to change and many leading farmers had a high level of awareness and acknowledged a need for their industry to become more environmentally aware. However, they noted that solutions require partnerships in which farmers feel respected and understood – and which recognise not only the environmental but also the social and economic dimensions; i.e. an holistic approach.

Common elements identified during this project indicated by coastal landowners and managers as critical to implementation include:

- Partnerships and support for productive land users (e.g. from Dunes Trust, management agencies (councils and DoC), adjacent public land owners and the wider community)
- Solution-focused attitudes – facing issues honestly but with a solutions focus and a commitment to working together and seeking mutually beneficial action and outcomes ("a NZ Inc attitude").
- Relevant provisions in district and regional plans
- Improved guidelines and information for restoration in backdune areas, including cost-effective techniques for large areas
- Long term planning and implementation focus.

Provisions in district and regional plans should minimise obstacles and costs associated with desired outcomes – so that appropriate change is not hindered by unnecessary bureaucratic and cost barriers.

There are significant gaps in scientific knowledge, especially in backdune environments. Cost effective restoration techniques for large areas is also a priority need – with current backdune restoration using natives often very expensive compared to alternatives (e.g. marram).

Effective long term solutions are likely to require planning and implementation over decadal timeframes, because of the scale and cost of the work, and the time required for native successional dune communities to develop. The required planning and implementation timeframes are a challenge given the dominance of shorter term considerations and pressures. However, the timeframes were also recognised as having benefits (e.g. incremental funding; providing time for partnerships to build and for trials to deliver useful information; etc).

There is considerable potential for the Dunes Trust to play a significant role in these various areas.

Direct Impacts on Coastal and Estuarine Wetlands

Coastal and estuarine wetlands have a range of very significant ecological values and provide significant ecosystem services to the economy. Major losses of these ecosystems have occurred historically and there is ongoing loss and degradation. Productive land uses are the primary cause of historic losses and ongoing pressure, with most estuaries adjacent to productive land having suffered extensive losses - largely through direct encroachment. In many cases, drainage and embankments have enabled productive land uses to encroach significantly over former coastal wetlands. Peripheral ecosystems (e.g. salt marsh; riparian buffers) have been particularly impacted.

The ecological issues have the potential to become even more serious with climate change, particularly projected sea level rise – as wetland ecosystems will expand landward in response to sea level rise. Ecologically, the landward expansion of peripheral wetland ecosystems (e.g. salt marsh) into adjacent low-lying land may be highly desirable or even critical to maintain these ecosystems in the face of sea level rise (depending on sedimentation rates). This has the potential to increase conflict between estuarine ecosystems and productive land uses.

Sea level rise will also impact on both drainage and water tables which will markedly increase the difficulty of using low-lying wetland areas reclaimed from the sea. In addition, surrounding low-lying areas will be subject to significantly increased risk from sea flooding. For instance, with current mid-range projections for the next century, areas that may presently flood only once every 30-50 years could be flooded by the sea several times a year (or even every large tide).

Opportunities to address direct impacts

The scoping study indicates that solutions to coastal and estuarine wetland issues will be difficult and complex. Studies have documented the potential to recover very large areas of coastal and estuarine wetlands that have been lost. However, the solutions generally require removal/exclusion of productive land use from estuarine wetland areas – even though a mixed solution proved to be appropriate at one site.

There was a surprisingly low level of awareness of estuarine wetland issues and a lack of demonstration areas of successful restoration – with most emphasis in NZ to date having focused on freshwater wetlands. However, it was noted by various parties that many farmers have set aside large areas of marginal land in other settings simply because of personal environmental values. Therefore, there would be value in raising awareness of the restoration opportunities among farmers and provision of relevant information and guidelines – provided it was clearly voluntary and not associated with regulation, i.e. that those

undertaking the restoration would be clearly seen to be doing so because of their own personal values – not through enforcement.

However, it was also noted that former coastal and estuarine areas can be significant to farm economics and there is a general pressure on the pastoral framing sector for increasing intensification of land use. Accordingly, retreat from many former coastal and estuarine wetlands would have significant adverse impacts on the economic value and viability of many farms. Practical solutions to these economic issues would be required. Restoring estuarine wetlands would also come up against a general cultural reluctance to "surrender land to the sea" and significant information and incentives are likely to be required (at least initially) to help overcome such barriers

A wide range of potential solutions were identified, including:

- Identification of areas suitable for wetland restoration and areas which may become estuarine or prone to serious sea flooding with climate change. Such information will be practical for many councils to supply – as many now have high resolution survey (e.g. LiDAR) data for coastal areas
- Development of useful guidelines promoting restoration of wetland areas, complemented by case studies. To date, there has been little work on restoration of estuarine wetlands in NZ and promotion of this activity – with notable exceptions (e.g. Project Manukau).
- Review of overseas experience – with retreat from low-lying estuarine areas having been undertaken quite extensively in some countries (e.g. UK and USA).
- Work on the economics of farming low-lying former estuarine and coastal wetland areas to improve information on this aspect. In areas, where significant economic benefits are associated with use of such areas, means of overcoming these obstacles and sustaining economic land use will be required.
- Incorporation of restoration case studies into marketing of agriculture, agricultural newspapers and journals, farm environment awards, farmer field days, etc – emphasizing farming and economic as well as environmental benefits to farmers.
- Assistance with the costs of fencing and restoration of estuarine wetlands and/or similar incentives. When complemented by guidelines and helpful and knowledgeable staff, these incentives can be effective and relatively low cost.
- Rating relief – even though this is often minor in economic terms it can be a useful incentive.
- Integration of wetland restoration with different economic opportunities (e.g. tourism; B&B; farm-stays; café; etc). Some farmers spoken to had integrated tourist activities into their farming, with coastal environments often well suited. These folk felt there was considerable opportunity in these areas but also noted a range of significant impedients (e.g. steep learning curves and lack of useful guidance and support; bureaucratic and cost obstacles). Case studies, seminars and workshops could potentially play a useful role in helping overcome these obstacles.
- Development or subdivision opportunities in return for wetland restoration. Many councils already provide such incentives for environmental gains. Well designed and focused provisions for wetlands could enable significant restoration – particularly as restoration of estuarine wetlands is often relatively low cost.
- Other solutions are likely to be developed with further emphasis on these environments. Different solutions and/or mixes are likely to be relevant to different situations.

- In view of the potential for significant wetland restoration gains, further work on developing these potential solutions is warranted in close collaboration with landowners, industry groups and management agencies.
- Improved information on the non-market values of estuarine and coastal wetlands (e.g. ecosystem services, biodiversity, social values) is also required. Over time, this will assist in better incorporating and accounting for these values in the overall economics of productive land uses.

Fencing of coastal margins including dune lakes and estuarine wetlands from stock and restoration planting, Cable Bay, Nelson. These landowners have integrated productive pastoral landuse with a tourism and accommodation venture providing additional stimulus to restoration of indigenous biodiversity to heavily modified coastal ecosystems.

Indirect Impacts on Coastal/Estuarine Wetlands

In addition to direct encroachment, historic forest clearance and ongoing forestry activities in steep areas have been implicated in serious estuarine ecosystem changes over the last 100-150 years, through increased sediment runoff. In many areas, studies have documented bed level changes and estuarine infilling that would have taken >2000-3000 years under the natural rates prevailing before human settlement. These changes have significantly altered the character of many estuaries (e.g. marked mangrove expansion due to bed level and possibly other changes).

Increasing nutrient runoff from more intensive land use also has the potential to impact some estuaries, particularly those with lengthy residence times. In some catchment types (e.g. steep rugged with intense rainfall and high erosion susceptibilities), there is increasing question about the sustainability of land uses that involve land clearance.

Opportunities to address indirect impacts

Continuous Cover Forestry appears to have considerable potential as a productive land use in catchments not well suited to land clearance (e.g. many areas of the Coromandel Peninsula and East Cape). In addition to the obvious ecological and environmental values, the use has the potential to provide a sustainable high value timber resource and tourism related returns.

There are also a range of other potential economic uses, including different uses associated with various successional stages of forest regeneration. It also appears likely to be the use best suited to maintaining the environmental, social and economic values of associated coastal margins (e.g. coastal estuaries and wetlands; fisheries; aquaculture; etc).

There are a number of significant barriers associated with productive forestry land use (e.g. apparent lack of returns in the short term) but also potential scenarios that could overcome such obstacles. There are also very significant information gaps which would need to be addressed. Nonetheless, the option of CCF does appear to have potential to provide a sustainable productive land use with significant economic potential. It is recommended that further work be undertaken to investigate the potential of this option.

DISCUSSION

Environmental awareness and commitment

Most land users we encountered had significant environmental values and commitment. While many lacked awareness of existing issues in regard to coastal dunelands and estuarine wetlands, there was a general appreciation that existing productive land use has significant environmental issues to address and a significant commitment to seeking practical solutions.

Over and again we were advised that there was an almost total emphasis on production in the advice and input that productive land users received from industry groups and farm advisors; with very little information in a relevant form from these sources on the environmental dimensions of their land use and industry. The general opinion was that these industry groups knew very little about environmental and sustainability issues. However, at the time of the interviews (September/October 2009) one dairy farmer noted that Fonterra appeared to be making more effort to become informed on those matters.

Training organisations were also viewed as deficient in this area. One farmer advised that a son had completed a diploma at an Agricultural ITO without hearing anything at all about the environmental dimensions of productive land use.

Central government was perceived as providing little useful input into resolution of the issues at farm level.

In general, public owned lands (whether DoC estate, Council reserves or Land Corp farms) were not regarded as providing useful models of appropriate management. One Northland farmer (and a Balance Farm Environment Award winner) when pointing out his boundary with the adjacent Land Corp farm noted rather dryly "their boundary begins where the trees end"!

Environmental awards

The main sources of environmental information in a useful form were generally identified as the Balance Farm Awards and associated field days and other farmers – with some also noting that individual Land Care Trust officers and regional council officers were well informed and helpful.

Most of the farmers we met were significant achievers in environmental areas (e.g. Balance Farm Award winners) with high levels of awareness and commitment. However, the

impression we gained from discussions was that the drive to increase production appears to be generally occurring in a framework where the environmental dimensions and costs are not well considered or appreciated.

Common concern was expressed at the apparent increasing urban-rural divide and negative perception of farmers in regard to the environment.

Farmers talking to farmers

In terms of solutions, "farmers listen to farmers' and "farmers learn from farmers' were recurring themes. We were repeatedly informed that real change is best promoted by farmer-farmer interactions and activities like Balance Farm Award field days where the benefits of integrating environmental values into farming practice can be seen and discussed

Work with the willing and with respected farm leaders was common advice for any work to more effectively integrate and sustain productive and environmental dimensions of coastal land. . Land Care Trust and some regional council officers were also commonly noted as helpful.

Directions to better integrate and sustain productive land use and environmental values were commonly identified as including:

- Improved understanding by all parties of both the environmental and the productive land use dimensions of the issues; and appreciation that both dimensions need to be addressed in any viable solutions.
- Less emphasis on compulsion and regulation and increased emphasis on understanding, communication, partnerships/collaboration and mutual support.
- A need to overcome the increasing rural-urban divide and associated misunderstandings.
- Less emphasis on lobbying and posturing by both industry and environmental groups; with increased emphasis on communication, overcoming existing suspicions/hostilities and building improved trust and mutual understanding.
- A focus on practical solutions.
- Recognition that viable solutions will require productive landowners, relevant industry groups, owners and managers of adjacent public land, management agencies and the wider community to work together and support each other.

CONCLUSIONS

The scoping study has:

- Identified a number of potential solutions for the issues around productive land use and critical coastal ecosystems that concern us and given us a stronger feel for the directions we have to pursue in seeking to develop practical solutions
- Strengthened our commitment to pursue this work collaboratively with productive land users and to seek solutions that also address the associated economic imperatives.
- Reinforced that there are many farmers and other groups (e.g. Land Care Trust) focused on seeking practical solutions.

DUNE RESTORATION TRUST
OF NEW ZEALAND

Why do we need the Dunes Trust?

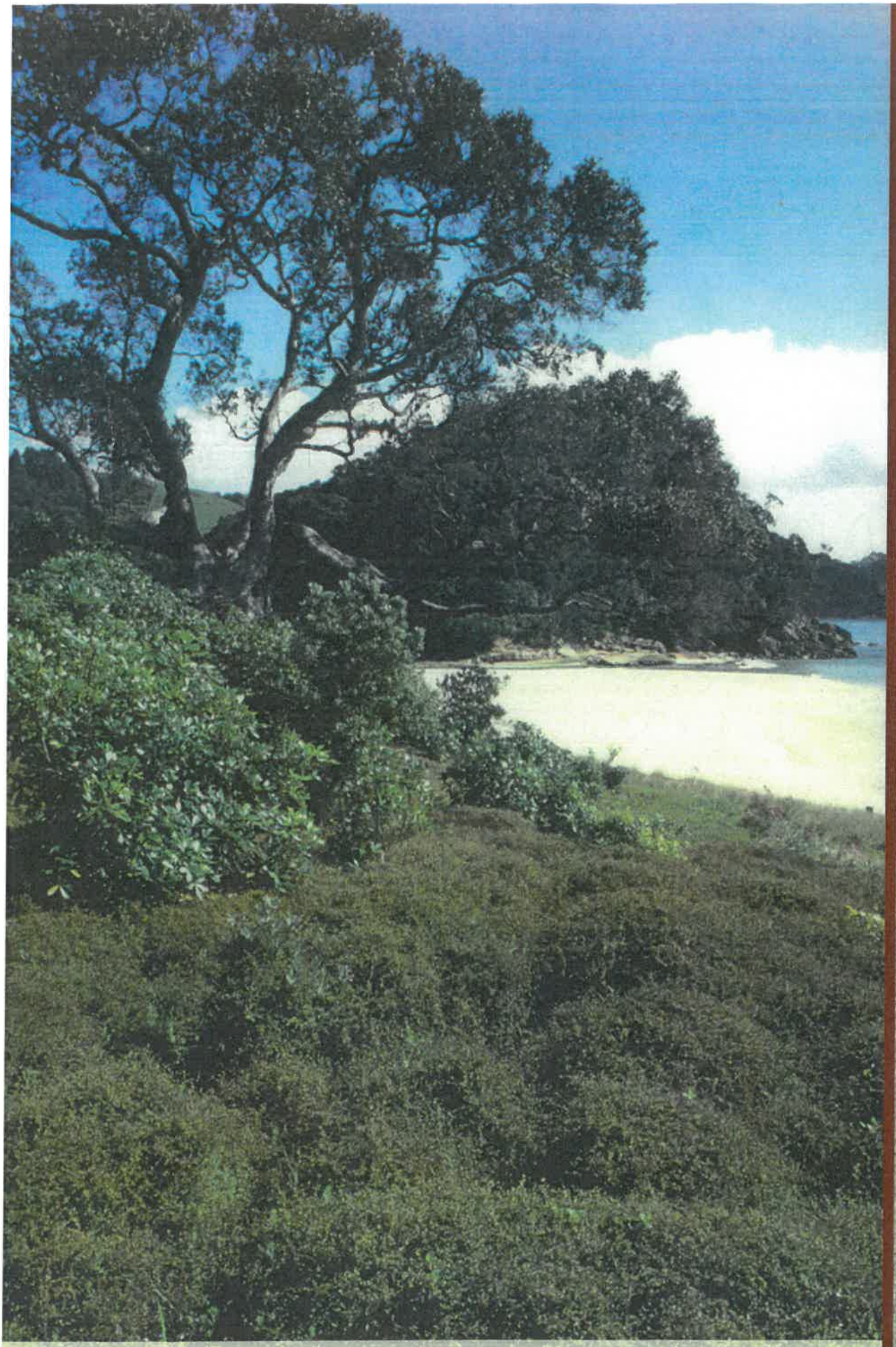
Coastal dune systems and their vegetation are a complex, dynamic and fragile buffer between the land and sea. We need ways to balance this vital but fragile ecosystem with our increasing desire to use our beaches and sand dunes for cultural, aesthetic and recreational purposes. We have found over the years that networking together is the best way to achieve this.

The Dunes Trust recognises that good information on restoration and management of our sand dunes with emphasis on native species needs to be widely available to our coastal communities.

What does the Dunes Trust do?

The Dunes Trust develops practical cost-effective techniques and options for dune restoration, with emphasis on native species wherever possible.

Members identify issues, prioritise research projects, make them happen and disseminate the research results throughout New Zealand.



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