The Important Role of Trees in Combating Coastal Erosion, Wind and Salt Spray

– a New Zealand Case Study.

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The Important Role of Trees in Combating Coastal Erosion, Wind and Salt Spray – a New Zealand Case Study.

- New Zealand is a geologically young country – inland hill and mountain country continues to supply silt and other debris onto beaches which are often actively aggrading.
- This debris builds up around the coast as sand-dunes which stabilise and protect inland areas from wind erosion and salt deposition.
- In appropriate use of the dune lands during settlement resulted in sand being released to drift inland, driven by the prevailing westerly winds.2

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- Drifting sand quickly covered roads, railways, valuable farmland, lakes and forests
- While in this case land-use practice was responsible for the drift of the sand, it could have been large waves or wind storms which created the problem

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- Around 150 000 ha of coastal dunes existed by early 20th Century
- Significant areas were on tribal lands

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- Some experimental work on stabilisation was commenced by the NZ Forest Service in the 1920s and 1930s, but major programmes were not started until the 1950s.
- The major objective was to protect important land and infrastructure, but commercial plantation forestry objectives were also targeted.
- Employment and social and economic benefits for local people were also anticipated.

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- There were a number of important considerations
  - Drifting sand was driven by new sand constantly blowing off the beaches. This could only be stopped by building and revegetating new fore-dunes.
  - Vegetation needed to be resistant to seasonal drought, salt laden winds, wind carried sand abrasion, and high surface temperatures
  - Nutrient status of the freshly deposited sand was very low or none-existent.
  - Work needed to start at the beach front or it was quickly overwhelmed by new sand deposits.

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- Damage to the foredune was one of the major reasons for sand running inland – "blow outs".
- Fore-dunes were rebuilt using thatch and later plastic mesh fences. Sand settled behind these and a new fence was built on the mound created.
- Once this reached adequate height planting with sand and wind tolerant plants took place – mostly marram grass (*Ammophila arenaria*).
- Marram grass is deep rooting, grows quickly in response to sand covering, salt tolerant and xerophytic.

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Rebuilding a fore-dune area with mesh fences

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- Rebuilt foredune after revegetation with marram grass and providing shelter for a local community

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- Once the fore-dune was under control inland regions were fixed using large scale marram grass planting
- Nitrogenous fertilisers are added to maintain the growth of the grass.

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- Low fertility of the site is assisted by planting the leguminous species, yellow lupin (Lupinus arboreus) which is tolerant of salt and wind and also has a deep rooting habit.
- As this establishes in the marram cover its shelter, and natural source of nitrogen encourages other plants to grow, creating a good weed mass in 3-4 years.
- Trees planted into this thicket in turn are well sheltered while establishing and also benefit from the natural nitrogen in the system. The favoured species is Pinus radiata from Coastal California, although this still suffers salt burn where heavily exposed.

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- Damage to stand edges can be minimised by planting a barrier of salt resistant species…in NZ's case *Cupressus macrocarpa.*
- Loss of growth at the stand edge is well illustrated in this photo.

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- Apart from the zone of greatest exposure immediately adjacent to the fore-dune commercial tree production occurs on the former sand-dune country.

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- In the NZ example use of trees to combat effects of coastal erosion, whether due to human factors, wind storms or waves has been able to both fix the sites and create a valuable commercial resource.
- Natural processes have been mimicked above the shore-line to hold new sand drifts and provide shelter for more valuable lands and infrastructure.
- Once drift of new sand of the beaches was stopped inland sites were stabilised with marram grass and yellow tree lupin, before a commercial crop of planted forest was established.

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- The sand-dune environment is hostile – abrading winds, high surface temperatures, dry soil conditions, negligible fertility, salt laden.
- Species used to recolonise the site were selected because of proven ability to tolerate these conditions.
- The leguminous nature of the yellow lupin which added the equivalent of relatively large doses of artificial fertiliser was particularly important.

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- The product of the stabilisation programme has been a successful commercial forestry enterprise supporting world scale wood processing operations
- Employment opportunities for local people directly in the project, but also in the spin-off wood processing activities have been created.
- Important agricultural land and buildings, roads, etc are able to operate in the shelter of the forests which also provide good recreational and beach access opportunities.

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- A new fore-dune provides protection for a local community from storms and high waves.

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