Woorim Beach Bribie Island and the revolutionary "FFF dune fence".

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ABSTRACT

A revolutionary new fencing system for fencing dunes is presented which works in harmony with the ever changing shape of the dunes and foreshore to provide a flexible solution to the challenge of reducing human pressure of these sensitive areas. This need arose during a Coastcare project at Woorim Beach Bribie Island undertaken by the "Friends of Woorim Beach". Two years of results from the planting of thousands of dune plants with protection by the new "FFF dune fence" are presented along with detailed design features and benefits. Some of the challenges that had to be incorporated into the fence included that it must not interfere with the nesting of endangered loggerhead turtles, be unobtrusive and inexpensive, and be simply relocatable in both vertical and horizontal directions as dune shape and foreshore are altered over time.

INTRODUCTION

This Project "The Woorim Beach Dune Stabilisation Project – Bribie Island, South East Queensland" was funded under the Australian government's Envirofund "Coastal and Marine Grants" program and was initiated by the community group "Friends of Woorim Beach" (FOWB). Moreton Bay Regional Council is a partner in the project contributing 2.5 klms of fencing, labour and signs. Wallum Action Group community nursery provided 25,000 native plants.

The project was highly commended in the Sunshine Coast Environment Council Awards 2010.

THE PROBLEM

Woorim Beach has been subject to severe erosion over many years. The latest erosion occurring in 2005/06 as can be seen in Figures 1 & 2. Sand was pumped to reclaim the beach as shown in Figure 3 leading to eventual recovery as shown in Figure 4

Figure 1 Woorim Beach erosion 2005.

Figure 2 Woorim Beach erosion 2005.

Figure 3 Woorim Beach sand replenishment.

As shown in Figure 4, the foreshore, although restored, has reduced resilience against future erosion due to the sparse vegetative cover. The original fence erected to exclude trampling has become completely buried, requiring the construction of a second fence which is also becoming buried. This

results not only in loss of function and investment but also creates a danger with partially exposed wires and the sharp ends of steel pickets.

Figure 4 Partial recovery of Woorim Beach following the severe erosion of 2005/06.

HUMAN IMPACT ON DUNES

The images of degraded foreshore shown in Figures 4 & 5 are unfortunately a common sight along much of the Australian coastline.

Figure 5 Typical foreshore at dense population & high use area - South Woorim Beach.

There is a tendency to become familiar with such sights and to perhaps think of these as just part of the normal cycle of coastal erosion and deposition. However on Bribe Island such foreshore degradation is almost uniquely associated with areas of greatest population density and beach use and is largely constrained to the four kilometre long developed area. This is most likely not a solely natural occurrence. This proposition is supported by the contrasting scene of largely intact dune and vegetation associations along the entire 20 kilometre long remainder of the eastern shoreline to the north adjacent to uninhabited natural areas as shown in Figure 6.

The same general pattern of exacerbated dune and foreshore erosion coinciding predominantly with areas of highest human presence and activity is a common theme, not just on Bribie Island, but around Australia's coastline generally.


Figure 6 Typical eastern ocean foreshore along the uninhabited approx 20 klms of Bribie Island.

The dominant main vegetation systems – *Casuarina equisetifolia* (She Oak) along the top of the dunes and *Spinifex sericeus* (Beach Spinifex grass) along the face and toe of the dunes are critical to the maintenance of these natural dune systems.

Beach Spinifex grass performs the simple yet remarkable role of trapping thousands of tonnes of sand as it blows up and down the beach forming a deep, wide fore dune toe that acts as a sacrificial buffer protecting the main dune. She Oaks are an essential partner as they trap further sand that escapes the Spinifex grass during very strong onshore winds and hold the main dune together.

These functions form the most basic starting principles required for effective foreshore management, yet it is surprising how commonly these basic principles are ignored with the sort of result depicted in Figure 7.

Figure 7 Dune loss and windblown sand following removal of dune vegetation for views – Woorim Beach.

The success of the Friends of Woorim Beach Coastcare project is based on these simple principles and entails mass plantings in combination with effective exclusion of beachgoers from the dunes using a pioneering new fence design as shown in Figure 8.

Figure 8 End result of the FOWB Coastcare project.

SIMILARITIES BETWEEN STREAMBANKS AND OCEAN FORESHORES

Many of the principles adopted to manage damage to the dunes were derived from detailed studies undertaken by the project "Management of Stock Access to the Riparian Zone" (Bell & Priestly 1996) as discussed below. Figures 9 & 10 show a stream (Buffalo Brook) in northern Tasmania which was one of the study sites for that project.

Figure 9 shows the stream prior to fencing in 1988 to prevent stock from accessing the stream. Such degraded scenes are common throughout rural Australia and we have become familiar with them just as we have with degraded foreshores. However, as with the linkage between the cause and resulting degradation from the impact by humans on the dunes, the same dramatic relationship between stock and stream degradation tends to be under-recognised. It is not until stock are totally excluded from the stream as was done at this location that the stream recovers and vegetation regenerates to the condition shown in the photo in Figure 10. Both photos were taken at exactly the same location. All regrowth was achieved through natural germination with no planting.

Figure 9 Buffalo Brook 1988 showing stream condition under conditions of unhindered access by stock.

Figure 10 Buffalo Brook 2004 the same location as in Figure 9 but after fencing to exclude stock.

Figure 11 shows the important role of vegetation in ensuring stream bank stability. The upper bank is stabilised by larger vegetation – trees and shrubs, while much smaller and seemingly less significant species such as reeds and aquatic plants stabilise the toe of the bank. However whilst these small species might seem insignificant,

they play a crucial role in preventing the commencement of stream bank erosion by the process of toe erosion and undercutting that can eventually undermine the larger vegetation (trees and shrubs) on the top of the bank. It's the same with dune systems.

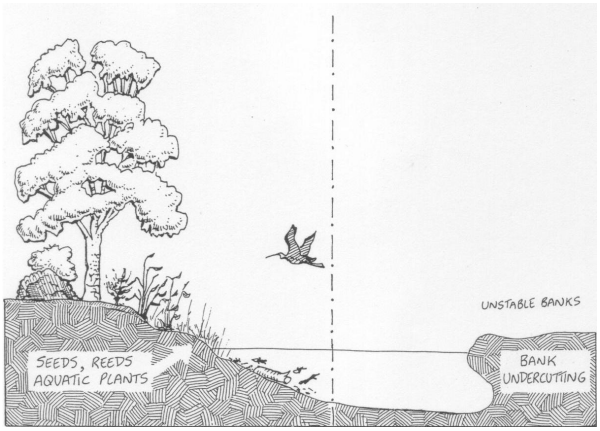

Figure 11 The role of vegetation types in protecting both the top and the toe of the stream bank from erosion and undercutting.

Following are the key principles established from studies on managing stream bank erosion by stock that are directly transferable to managing damage by humans to coastal dunes.

1. Much of the impact seen is insidious and there is a tendency to accept this as part of the normal Australian landscape. Cause and effect connections tend to be under-recognised resulting in severe degradation and costly remediation by engineering works.

2. The simple act of excluding the impact of trampling and damage to vegetation can bring about a remarkable recovery to a more natural state that is more resilient to the forces of nature. Overall aesthetics and amenity of the area are greatly improved and important habitat for wildlife is provided.

3. To deal with the challenge of fencing in such a hostile and aggressive environment, it was necessary to develop new fencing designs and principles to replace the old failed systems that have been the weak link in ensuring protection of this critical vegetation zone. For fencing streams, a new flood-proof stock fence was developed and was featured on the ABC TV's New Inventor's Program - Episode 11 on 19 May 2004. Similarly a completely new fencing system was needed to address fencing in the challenging foreshore zone, resulting in the invention of the "FFF dune fence" which was developed specifically for this application.

4. The amount of damage done to the vegetation by trampling is proportional to the number of intrusions into the area and the time spent in that area. However it might not be essential to totally remove all sources of impact at all times in order for the vegetation to survive and flourish.

5. Suitably resilient, protective fencing and plants, in conjunction with appropriate conditions for regeneration facilitate recovery of the naturally occurring protective vegetation with minimal intervention. This process is commonly much more rapid for dunes compared with streams.

NEW FORESHORE FENCING SYSTEM – THE "FFF DUNE FENCE"

The "FFF dune fence" is being adopted by some councils in Queensland. Feedback to date is that the fence is quick and simple to erect and is much less expensive than traditional fencing due to lower cost of materials required and significantly reduced installation and maintenance costs. This simple, flexible and robust design ensures that the fence will not to become a lost asset by becoming buried. The "FFF dune fence", properly installed and maintained, will last for several years and facilitates the accumulation of vast amounts of sand for dune establishment.

As shown in Figure 4, traditional fences are not suited to the beach and become buried, eventually rendering them useless and a considerable waste of expenditure. Buried or semi-buried fences are also dangerous. Clearly a completely different approach is necessary in fencing along the foreshore.

This new fence (refer Figures 11,12,13,14) enables adjustment of fence height to suit the changing shape of the dunes by sliding the steel star picket either up or down the wooden post after releasing the chain retaining screws. Four wires are adequate to provide an exclusion zone. It is recommended that suitable signage be attached centrally in each span to explain the purpose of the fence and to highlight the

presence of the wires. Visible indicators such as streamers are an option.

Wires can be retensioned as necessary by adjusting the ratchets at either end of the span. The timber posts are 4 metres long, pointed and driven 2 metres into the sand. Because only minimal wire tension is required and with the posts 2 metres into the sand, there is no need for a conventional double post end strainer assembly. However a 600 x 150 x 50 mm thrust block is required to be buried approximately 500 mm deep against each end post to provide additional support against the strain of the wires. This is also required at any change of direction. Post spacing is nominally 25 to 50 metres and at the main high and low points along the foreshore. With longer post spacings it is recommended that droppers be used to maintain wire spacing. Closer spacing of posts has the benefit of possibly avoiding the need for droppers.

Figure 12 The new "FFF foreshore fence" design as adopted by the project.

The alignment of the fence is chosen with the posts located on an existing rise or dune formation with the intention of commencing sand reclamation and dune formation towards the sea. Posts must be above maximum high tide level such that the buried portion of the posts is never in saturated sand as this would result in loss of rigidity.

As sand becomes deposited following the resultant advance of stabilising grasses the shape of the dunes will change and some posts will become partially buried. When there is insuffient space on the timber post to continue to raise the attached steel picket, the timber post can be jacked up as required. However, a minimum of two metres depth must be maintained. Similarly if some posts become more exposed they can be re-driven to their original depth, however deposition rather than erosion will be the normal trend.

Figure 13 Intermediate post.

Figure 14 Single end strainer post at walkway supported by buried thrust block.

If required the entire fence can be dismantled and relocated by detaching the steel posts and attached wires, removing all timber posts and relocating. This is desirable to facilitate the continued seaward advance of the dune which is a natural resulting trend following the erection of the fence and the spread of dune grasses which entrap wind blown sand.

The fence has been designed to provide a much safer environment with no sharp protrusions and nothing to cause tripping as can occur when traditional fencing is employed on the foreshore.

This design, with only a minimum of wires (nominally 4) and explanatory signage, is sufficient to discourage the vast majority of beachgoers from entering the dune area, resulting in recovery and expansion of protective vegetation. Unlike conventional fencing, the "FFF Dune fence" is turtle friendly allowing access under the bottom wire for nesting.

The design and information provided on the "FFF dune fence", which are totally new in concept both nationally and internationally, are not subject to any patents or patent applications and are provided freely in good faith under the following conditions:

1. No responsibility or liability is accepted by the project or those involved in the design of this fence including any variations. Any claim that may arise as a result of its installation or use is the owner's responsibility.

2. In any mention, use or application of the fence as shown herein, credit is given to "Friends of Woorim Beach Bribie Island and Ian Bell (inventor/desiger) & "FFF Fencing" TM

TAKE HOME MESSAGES

1. Maintaining, protecting and growing the natural dune profile and associated natural vegetation communities that exist prior to development and impacts by humans is fundamental for successful foreshore management.

2. The crtical zones for establishment and maintenance of a self regenerating sand reserve to buffer the regular assaults of the sea consists of two main vegetation elements. In south-east Queensland, examples of key plants ideally suited to these zones are *Casuarina equisetifolia* (She Oak) on the main dune and *Spinifex sericeus* (Beach Spinifex grass) on the foredune. Beach Spinifex in particular is deserving of a higher level of recognition for its amazing resilience and capacity to capture massive volumes of sand regularly offered by the sea.

3. Once these natural dune systems are lost, the foreshore becomes much more susceptible to undermining and collapse with the loss of huge volumes of sand. The resultant emergency for beachfront property and infrastructure created by this state of imbalance and loss of natural buffer is often a significant factor in the need for expenditure of millions of dollars to construct hard engineering barriers and treatments. Such works may not only be unnecessary, they also detract from the natural beauty of the foreshore and its function as an important part of the ecosystem.

4. Throughout Australia, achievement of effective foreshore protection by preserving and enhancing the essential function of natural dune and vegetation systems, particularly in high use areas, has been severely limited. Two main factors are responsible for this:

A. Lack of understanding by foreshore managers of the essential role and function of natural dune systems.

B. The lack of availability of a suitable fencing system for this harsh and ever-changing environment.

The new "FFF dune fence" addresses the second problem and hopefully opens to door to a new era of natural dune preservation.

References:

Bell I, Priestly T, (1998) "Management of Stock Access to the Riparian Zone" a project under the Rehabilitation & Management of Riparian Lands R&D Program. Land & Water Resources Research and Development Corporation. Canberra.