



# **Seven Mile Beach (Precinct 2) Beachfront Management Plan**



**Environmental Training and Employment Inc.  
EnvITE NSW**

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Brian Smith of the Lennox Head Residents Association also assisted with preparation of the plan.

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## EXECUTIVE SUMMARY

The Seven Mile Beach (Precinct 2) Beachfront Management Plan provides strategies and actions to restore native vegetation communities and provide appropriate public facilities at Pacific Parade, Seven Mile Beach, Lennox Head. The area addressed in this plan is the eastern side of Pacific Parade between Byron Street and Ross Street.

The topography of Seven Mile Beach, and in particular the foredunes, is subject to continual changes in response to wave energy and tidal dynamics. The beach is prone to severe wave attack during high seas and wind erosion can create blowouts, particularly in beach access areas. Various protection works have been implemented over the years.

Site inspections were conducted in September and October 2004. Remnant vegetation was assessed and native and weed species present were identified. Recreational usage patterns and impacts were assessed. This included the presence and condition of tracks, fences, carparks and public facilities. The plan takes into consideration public consultation that was undertaken through Precinct Plan Meetings coordinated by Ballina Shire Council.

Remnant vegetation at Seven Mile Beach has been highly disturbed by mining, clearing, erosion control works and weed infestation. The plan assesses the condition and regeneration potential of existing native vegetation. The study site has been divided into five zones. Each zone is described and recommendations made for management of each area.

Environmental weeds occur sporadically though out the area. Weed species present include Bitou Bush, Madeira Vine, Turkey Rhubarb, Yucca and Coastal Morning Glory. Some exotic species which have potential to dominate native vegetation have been planted in the past. This plan recommends strategic control methods for weeds and appropriate species for revegetation.

Management issues include stormwater, dune reconstruction and protection, inappropriate beach access, provision of public facilities, car parking and tree vandalism. Other issues addressed include aboriginal relics, fauna, signage, community education and rubbish dumping.

The plan provides information on weed species, weed control and vegetation restoration techniques. Works aim to minimise the impact of erosion through strengthening dunes and provision of appropriate stormwater management, beach access and facilities. It is important to monitor the project to record progress and to guide restoration works.

The implementation of this plan will enhance the area to meet the needs of locals and visitors. Recommended land management practices will maximise the resilience of the area to natural (eg. storm) and human (surf carnivals) impacts. The plan will contribute to increased public awareness of the importance of coastal vegetation and encourage local stewardship for the area.

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## 1. INTRODUCTION

### 1.1 Aim of Plan

The aim of the Seven Mile Beach (Precinct 2) Beachfront Management Plan is to provide strategies and actions to restore native vegetation communities and provide appropriate public facilities at Pacific Parade, Seven Mile Beach, Lennox Head.

In addition to restoration of vegetation, the plan aims to:

- enhance the area to meet the needs of locals and visitors.
- implement land management practices that will maximise the resilience of the area to natural (eg.storm) and human (eg. surf carnivals) impacts.

### 1.2 Objectives of Plan

The objectives of the Beachfront Management Plan and its recommended works are:

- to identify and assess threats that are contributing to the degradation of the beachfront area
- to assess the condition and regeneration potential of existing native vegetation,
- to provide information on weed species, weed control and restoration techniques,
- to make recommendations for the maintenance of the vegetation communities
- to suggest best practice methods to undertake vegetation restoration with the aim of maintaining dune stability and improving resistance to erosion,
- to minimise the impact of erosion through strengthening dunes and provision of appropriate stormwater management, beach access and facilities.
- to provide amenities (tracks, fencing, tables, taps etc.) which enable the public to use the area in a sustainable way,
- to increase public awareness of the importance of coastal vegetation and encourage local stewardship for the area, and
- to act as a supporting document for further funding.

### 1.3 Proposed Outcomes

The plan aims to provide practical guidelines to those involved in management, to:

- improve the general amenity for local residents and visitors (aesthetic, recreational and educational),
- provide improved recreational infrastructure,
- reduce the impacts of erosion / stormwater, and
- enhance the resilience and regenerative capacity of native vegetation.

## 2. SITE DESCRIPTION

### 2.1 Location

Seven Mile Beach is located at Lennox Head in Ballina Shire (northern New South Wales (NSW)) (Figure 1). The beach delineates the eastern boundary of the village of Lennox Head, and extends from Lennox Headland in the south to Broken Head in the north (in Byron Shire). The area addressed in this plan is the eastern side of Pacific Parade between Byron Street and Ross Street. This area is approximately 750 metres in length.



**Plate 1: Looking south towards Lennox Head.**

### 2.2 Geomorphology

Seven Mile Beach is formed upon Quaternary (Holocene) beach and dune sand. The beach itself consists predominantly of coarse grained quartz sand with some shell fragments deposited by wave action. The dunes consist of fine to coarse grained aeolian quartz sands (Morand, 1994). The topography of Seven Mile Beach, and in particular the foredunes, is subject to continual changes in response to wave energy and tidal dynamics. The beach is prone to severe wave attack during high seas and wind erosion can create blowouts, particularly in beach access areas.

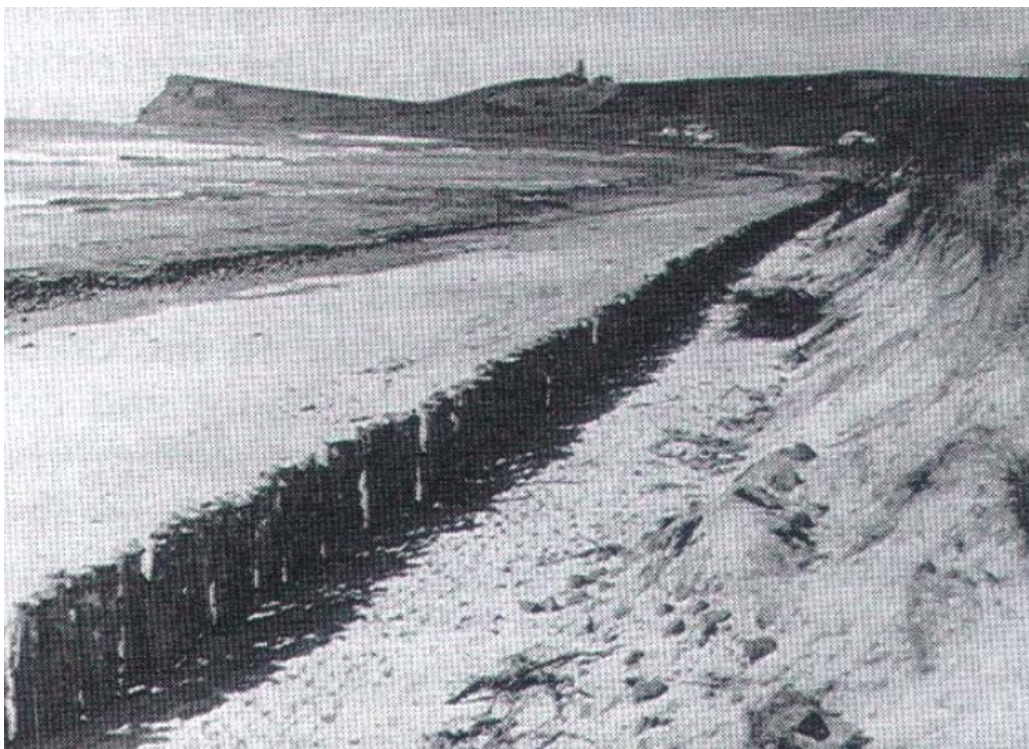
Mineral sandmining was carried out at northern Seven Mile Beach from the 1930s to the 1970s (Plate 2), (Morley, 1981). However, the modified structure of the dunes in the study area is the result of erosion associated with cyclone events. In particular, the cyclone of June 1967 caused several significant breaches of the dunes. Damage from this event could have resulted in the loss of property if it were not for the combined efforts of residents and local Councils who constructed a 'Ti Tree fence' extending along the foreshore. This fence limited erosion from the cyclone and effectively began accreting sand. From time to time parts of this fence are uncovered in the sand, providing testimony to the longevity of the 'Ti Tree' (*Melaleuca quinquenervia*) poles used (Plate 3). The dune structure and vegetation communities are now less complex, with fewer micro-environments, than previously existed.

The beach experiences significant erosion. Various protection works have been carried out implementing the Lennox Head Beach Management Plan in 1993. The Ballina Coastline Hazard Definition Study Draft Final Report identifies immediate hazard zones that extend landward to Pacific Parade between Byron and Foster Streets. Longer term hazard zones extend into the developed area landward for the entire unprotected length of Pacific Parade. Bedrock and seawalls are known to exist but are presently buried beneath the sand. It is likely these walls will be exposed during a major storm event and may influence the degree of erosion (WBM 2004).





**Plate 2: Sand mining on Seven Mile Beach in 1935 (Source: Morley, 1981).**



**Plate 3: Ti Tree fence at Lennox Head in late 1960's (Richmond River Historical Society 1997).**

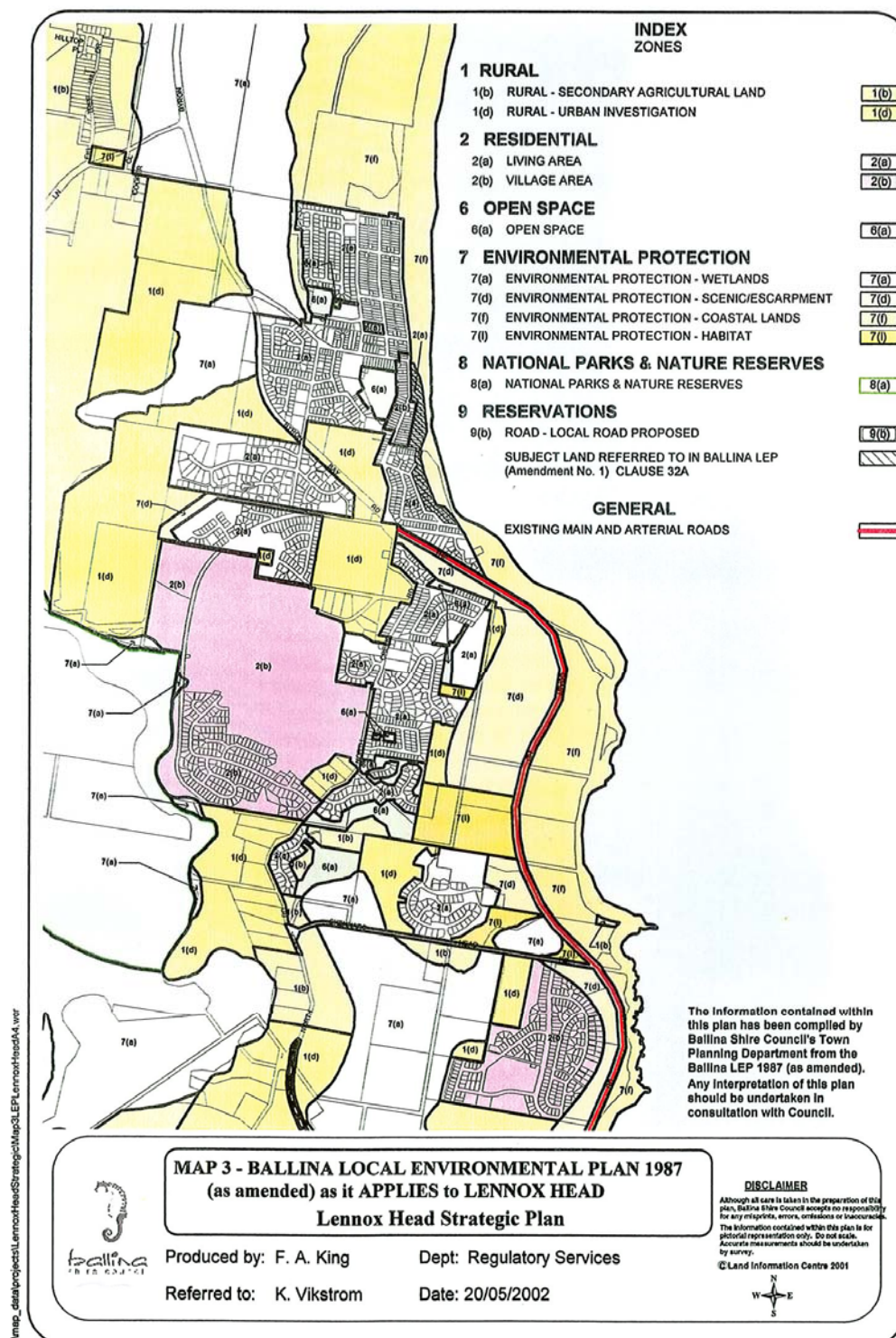
### **2.3 Climate**

North-eastern NSW experiences a temperate to subtropical climate due to its geographic location. Average rainfall fluctuates between 1600 and 1700 millimetres per year, with the highest falls in summer (November to April) (Anderson, 1999). Frosts are generally absent in the immediate coastal strip. The prevailing wind is from the southeast, however strong winds from the north are experienced in the spring and summer.



## 2.4 Land Tenure

The study site is zoned 7(f) Environmental Protection-Coastal Lands under Ballina Shire Councils Local Environment Plan (2000). The land below mean high tide is Crown Land and is unzoned.



**Figure 1: Ballina Local Environmental Plan 1987 as it applies to Lennox Head.**

## **2.5 Site History and Use**

### **2.5.1 Aboriginal History and Use**

Prior to European settlement, members of the Bundjalung nation occupied several areas around the Richmond River. A well preserved Bora Ring is located in Gibbon Street in Lennox Head. This ceremonial site for Bundjalung people and the adjacent well established workshop areas, campsites and middens bear witness to long occupation and was declared an Aboriginal Place under the management of the National Parks and Wildlife Service (NPWS) in 1973 (RRHS, 1997). A survey carried out by Collins (1992) for a subdivision south of the lake revealed four open campsites containing stone artefacts.

Midden sites have also been recorded to the north and south of Seven Mile Beach on old remnant dunes behind the beach (Campbell, 1982) and small deposits of *Turbinidae* sp. shells have been uncovered near the existing four-wheel-drive beach access track by Dunecare workers. Jolander Nayutah from the Gungil Jindabah Centre at Southern Cross University (Lismore) has advised that Lake Ainsworth is the subject of a dreaming story relating to three Bundjalung brothers, which has been documented by NPWS officers (AWACS, 1996). The lake was also known to contain large eels and turtles in the past that would have supplemented other food resources, such as the Pipi (*Plebidonax deltoides*) and seasonal mass gatherings of spawning mullet, tailor and salmon. If a midden or archaeological deposits are uncovered during restoration works, the location should be immediately reported to the NPWS before continuing further disturbance.

### **2.5.2 European History and Use**

The coastal foreshore along Seven Mile Beach Lennox Head is a highly developed area abutting residential development. The area has a long history of disturbance through clearing sand mining, erosion control works, and weed infestation. The stretch along Pacific Parade north of the Lennox Central Business District to the Lennox Head Alstonville Surf Club consists of a highly mobile beach berm and incipient dune, a continuous foredune and a small hind dune system that abuts onto Pacific Parade.

The study site consists of a series of mown park like areas, exotic plantings (primarily Norfolk Island Pines) inter-dispersed with areas of rank grass and ground covers, weed infestations and highly fragmented remnants of native vegetation including sites containing littoral rainforest species. There appears to be considerable senescence, die back and possible vandalism in many of the patches of native vegetation along the hind dune. A large number of single dead trees are visible on the rear of the foredune.

A series of formal sealed car parks have been constructed east of Pacific Parade, often adjacent to the native vegetation on the hind-dune. A larger car park is located opposite Ross Street at the northern end of Pacific Parade adjacent to the Lennox Head Surf Club. Low witch hat bollards delineate the car parks preventing encroachment by vehicles onto the dune system. Many of these have been partially buried and some are difficult to see. They have limited function and may be accidentally driven over by unaware drivers.

Other than the area opposite the Lennox Head Hotel which contains a toilet block, lighting, shelter and seating the infrastructure along Pacific Parade is limited to several bench seats, a shower unit opposite the end of Lennox Street and two taps (one with spring loaded auto turn off, one with no handle (vandal proof)) between Lennox and Foster Streets. Another shower facility is located in the large car park opposite Ross Street. Regulatory signage is found at the end of the side streets on the 'main' tracks.

A large number of tracks cross the dunes providing pedestrian access from the car parks and the mown areas. A number of shorter racks are found on the hind dune providing access to Pacific Parade. The large number of informal tracks increases the possibility of wind and wave erosion.

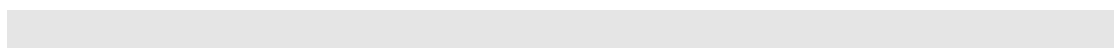
Five stormwater pipes discharge onto Seven Mile Beach, draining Pacific Parade and its side streets (Lennox Street, between Lennox and Foster Streets, Foster Street, William Street and Ross Street). To reduce potential blockages due to silting by sand the discharge points are located in the dunes. The discharge plume prevents reformation of dunes and the ability of Spinifex to re-establish.

Fencing (post, wire and shade cloth) has been erected to manage dune erosion and control pedestrian access by the Lennox Head Residents Association between Byron Street and Lennox Street at the southern end of the beach and from Ross Street to the Lennox Head Surf Club site at the northern end.

Sand mining operations commenced at Seven Mile Beach in 1935 primarily to procure the heavy metals zircon, rutile and monazite (Morley, 1981) (Plate 2). Many thousands of hectares were mined for these minerals in Ballina Shire, until in June 1977 the State Government established the current policy on coastal sand mining. As established leases expired, they were not re-granted and mineral sand mining was progressively phased out along the entire NSW coast (Moffatt, 1997).

Old barbed wire that is sometimes encountered amongst the dunes is believed to be the legacy of an army encampment established beside Lake Ainsworth during World War Two (Apps, D., 2002, pers. com).

Seven Mile Beach is now mainly used for recreation, particularly swimming, surfing and fishing, with high visitation on weekends and holiday periods. Four-wheel-drive vehicles, dogs and horses are currently permitted on the beach north of Lake Ainsworth.



### 3. SITE ASSESSMENT

#### 3.1 Methods

Site inspections were conducted in September and October 2004. Remnant vegetation was assessed and native and weed species present were identified in the field. Recreational usage patterns and impacts were assessed. This included the presence and condition of tracks, fences, carparks and public facilities. Site assessment also considered other impacts on the beachfront including stormwater outlets and natural events such as storms.

This plan takes into consideration public consultation that was undertaken through Precinct Plan Meetings coordinated by Ballina Shire Council. An on site meeting was also conducted with representatives of Lennox Head Residents Association. This meeting focused on dune management in the study area.

#### 3.2 Vegetation

##### 3.2.1 Native species

Remnant vegetation at Seven Mile Beach has been highly disturbed by mining, clearing, erosion control works, and weed infestation, but indicator species remain from which a model for restoration can be derived. The study site has been divided into five zones for the purpose of this management plan (**Figure 2**). Native vegetation in each zone is described in Tables 1 to 5. No threatened flora species were encountered in the survey.

Northern Seven Mile Beach, towards Broken Head has had lower levels of disturbance and, despite sand mining, displays a higher diversity and integrity of native vegetation communities. These areas can be used as models for appropriate species at Lennox Head and are a possible seed source for revegetation. Areas adjacent to Lake Ainsworth support a frontal dune of sclerophyll vegetation dominated by a *Banksia integrifolia*, *Acacia sophorae* association. The *Acacia sophorae* and *Casuarina equisetifolia* in these areas have, in most cases, been planted by Lennox Head Dunecare.

##### 3.2.2 Weed species

Environmental weeds occur sporadically throughout the entire area. Weed species present include Bitou Bush, Madeira Vine, Turkey Rhubarb, Yucca and Coastal Morning Glory. Some exotic species which have potential to dominate native vegetation have been planted in the past. This plan will recommend appropriate species for revegetation. A description of the major weeds at Seven Mile Beach is included as Appendix 3 and weed control methods are described in Appendix 4.

### **3.3 Fauna**

The study area contains little viable habitat for fauna. Brown snakes, pythons and a variety of lizards may be encountered amongst the dune vegetation and a variety of seabirds and raptors visit when feeding. A search of the NSW Wildlife Atlas for threatened or vulnerable fauna species revealed one record of the Pied Oystercatcher (*Haematopus longirostris*) sighted within the study area in 1987. Ballina Shire Councils database provides additional records of two species of threatened fauna recorded on Seven Mile Beach. These are the Loggerhead Turtle (*Caretta caretta*) (one sighting) and Little Tern (*Sterna albifrons*) (one sighting).

### **3.4 Other Management Problems**

#### **3.4.1 Stormwater**

Within the study area five storm water pipes emerge from the base of the dunes on Seven Mile Beach. When flowing, these limit the ability of an incipient dune, and associated vegetation, to form in their immediate proximity. Ballina Shire Council plans to investigate lengthening the storm water pipes over time to facilitate sand accretion on the foredune.

#### **3.4.2 Uncontrolled and inappropriate beach access**

Inappropriate or informal beach accesses limit vegetation binding of sand and can exacerbate local dune erosion and may cause “sand blows” to hind dune areas. Access to the beach is recognized as necessary but the number of access ways should be limited to occur only where the highest volumes of users occur (e.g in line with carparks and street junctions).

Department of Planning, Infrastructure and Natural Resources (DIPNR) guidelines recommend that beach access points should not be any more frequent than every 50 metres. Currently there are a large number of informal access points that are likely to be used by a small number of residents. This plan proposes to close these unnecessary tracks and to formalize those that are most appropriate (Figure.2).

It is recommended that Council immediately close and rehabilitate any unapproved or inappropriate tracks. If closure of the track is ignored, Councils regulatory services department may take further action against those persisting in its use.

#### **3.4.3 Public Facilities**

Public toilets are located in the bus stop reserve adjacent to Byron Street and north of the surf club. No public toilets are present in the immediate study area. The need for public toilets was identified as a low priority in the Precinct 2 community consultation process.

Outdoor showers are present at one location within the study area, opposite and slightly to the north of Lennox Street. This shower has been constructed recently and features an innovative design utilizing recycled plastic components. Runoff from this shower can be high in peak tourist seasons and is currently uncontained. Planting of *Dianella caerulea* or *Lomandra hystrix* on the downhill side of showers will prevent the area becoming boggy. There may be an opportunity to drain excess water through agricultural drainage pipe to the site of new tree plantings.



A number of simple bench seats are located along the foreshore. Seat design varies including modern aluminum seats to benches made from timber. The timber seats are located in the shade of trees while the new seats are in full sun. Additional seating was identified as a low priority by the precinct 2 meetings, but there would appear to be opportunities for new seating particularly in the north of the study area.

#### **3.4.4 Carparking**

There are a number of small car parks on the eastern side of Pacific Parade which appear adequate for needs with the exception of times when surf contests such as ‘Gromfest’ and ‘Allgirls’ are held. During these events, traffic can become congested but car parking is available in the streets that run parallel to Pacific Parade. This plan does not propose additional carparking. It is recommended that overgrown grass in existing car parks be trimmed back to the original paved area. Concrete ‘witch hats’ that define the car park boundaries are difficult to see from vehicles and have caused damage to some vehicles. These should be replaced by durable and aesthetically acceptable bollards of at least one metre high. Construction of bollards between car parks may be necessary opposite the hotel to prevent 4WD vehicles parking on the grassed hind dune area.

#### **3.4.5 Tree Vandalism**

A number of dead and dying trees are present in the study area. The causes of death appear to be natural. Particularly affected are the Horsetail Sheoaks (*Allocasuarina equisetifolia*) which have reached the end of their lifespan.

While unauthorized tree pruning has occurred in the past there was no evidence during the recent assessment of this or tree poisoning being carried out. Vigilance should be continued though, particularly in the vicinity of new development. Report damage or suspicious behaviour to Ballina Shire Council for further investigation.

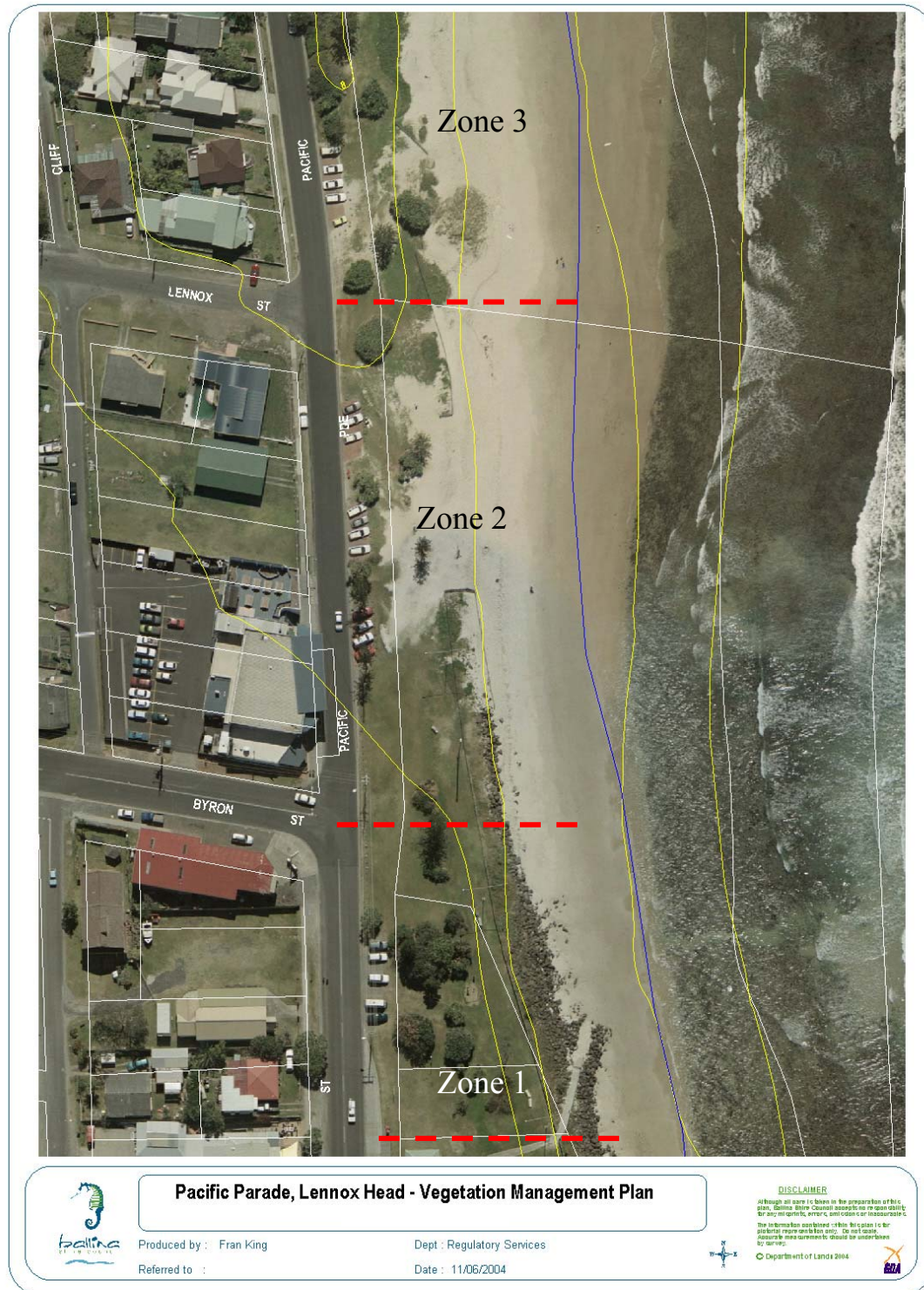
Where trees have been vandalized or are in rapid decline, it is recommended that Council immediately erect protective fencing constructed of shade cloth and timber to the same height as those trees damaged. This fencing will be accompanied by planting of native coastal species and will remain in place until the planted stock has reached a height equaling that of the fence or of the originally damaged trees.

#### **3.4.6 Pandanus Leaf Hopper**

A serious threat to Pandanus in Ballina Shire is the potential infestation by Pandanus leafhopper (*Jamella australiae*). This insect, native to North Queensland, has been accidentally imported to Northern New South Wales and Southern Queensland through distribution of landscape plants.

The leafhopper causes Pandanus dieback. The female lays eggs on the backs of the Pandanus tree’s leaves. When the eggs hatch the leaf hoppers feed on the tree’s sap. The insects produce a sticky substance called honeydew which encourages mould growth. This makes the leaves drop and kills the tree’s growing points, eventually causing the death of the tree. Symptoms consist of black stripes of honeydew on the underside of branches and general yellowing and dieback. Upon closer inspection of the crowns the fingernail shaped insects can be seen, as may be masses of woolly white eggs.

The leafhopper can be controlled, if detected early, by application of the low toxicity insecticide Confidor®. Entomologists are investigating potential biological controls. It is recommended to report the incidence of Leafhopper to Ballina Shire Council for treatment and monitoring.



**Figure 2: Zone 1 and Zone 2, Lennox Head**





**Figure 3: Zone 3, Lennox Head**



**Figure 4: Zone 4, Lennox Head**





Figure 5: Zone 5, Lennox Head

## 4. RECOMMENDATIONS

### 4.1 Zone Vegetation Descriptions and Recommendations

**Table 1: Recommendations Seven Mile Beach - Precinct 2 - Zone 1**

Priority ratings = High (within 12 months) Medium (within 3 years) Low (within 5 years)

Zone No Vegetation description	Recommendations	Priority	Agency
<b>Zone 1.</b> <b>Bus stop reserve</b> This reserve is used primarily for passive recreation. It has a picnic shelter, toilet block, simple swing set and a number of aluminium bench style seats.  Some garden beds have been established to increase wind protection and amenity. These are overrun with exotic grasses and plants (Plate 3).  Old trees at the end of their life span occur in the reserve. With the exception of Pandanus, most are in poor health and provide no shade (Plate 4).  Turf grass is in reasonable condition due to little concentrated wear.  The foredune has been rock armoured (Plate 5), but bears a few opportunistic native species such as Warragul Spinach ( <i>Tetragona tetragonoides</i> ), Beach Bean ( <i>Canavallia rosea</i> ) and Goats Foot ( <i>Ipomoea pes-caprae</i> ).	<b>Garden Beds</b> <ul style="list-style-type: none"> <li>Define garden perimeters with hard edging</li> <li>remove grasses and weed species, prune shrubs for health</li> <li>supplement plantings with salt tolerant ornamental non-invasive species.</li> <li>Fertilise and mulch completed beds.</li> </ul>	Low	Lennox Head Residents Association (LHRA) or Ballina Shire Council (BSC)
	<b>Revegetation</b> <ul style="list-style-type: none"> <li>Replace dead and dying trees with hardy local coastal species such as Three-vein Laurel (<i>Cryptocarya triplinervis</i>), Coastal Banksia (<i>Banksia integrifolia</i>) and Tuckeroo (<i>Cupaniopsis anacardioides</i>).</li> <li>Protect plantings with tree guards until well established (diameter at breast height 450mm). Maintain traditional views.</li> </ul>	Medium	BSC
	<b>Other</b> <ul style="list-style-type: none"> <li>Retain native opportunists for the role they play in softening the appearance of the rock wall.</li> </ul>	Low	BSC
	<ul style="list-style-type: none"> <li>Refer to Geolink <i>Lennox Head Village Master Plan</i> for complete upgrade concepts for this park.</li> </ul>	High	BSC
	<ul style="list-style-type: none"> <li>Monitor Pandanus for Jamella (leaf Hopper) infestation, report to BSC if observed</li> </ul>	High	BSC + local residents





**Plate 4: Garden beds established to increase wind protection and amenity have become overrun by weeds.**



**Plate 5: Dead and dying old trees are recommended for replacement**



**Plate 6: View from Zone 1 towards Zone 2. Rocks have been placed on the foredune in an attempt to limit coastal erosion.**

**Table 2: Recommendations Seven Mile Beach - Precinct 2 - Zone 2**

Table 27: Recommendations for Seven Mile Beach - Footnote 2	Zone 2
<p><b>Zone 2.</b></p> <p><b>Byron St to Lennox St.</b></p> <p>This section of foreshore has been highly modified with the whole area being turfed and mown.</p> <p>It experiences a high level of visitation throughout the day and seasonally intense use associated with surfing competitions. As a result turf is worn and in poor condition (Plate 6). An information sheet on conduct, ethics and public safety should be developed by BSC and distributed to surf comp organisers.</p> <p>In storm events the foredune is occasionally eroded away (no rock armouring) and the grassed area covered in sea spume or sand.</p> <p>The Lennox Head Residents Association have established protective dune fencing and a defined beach access track (Plates 8 &amp; 9).</p> <p>Aluminium seating and a shower are provided (Plate 10).</p>	<p><b>Improve turf</b></p> <ul style="list-style-type: none"> <li>• Maintain general contour of area but remodel high use area by,               <ol style="list-style-type: none"> <li>a) scrape off mixed grass with bobcat</li> <li>b) prepare exposed surface with an alluvial soil of high organic content</li> <li>c) lay reinforced turf product such as STAYturf® as per manufacturers directions (see Appendix 8 for detail).</li> </ol> </li> </ul> <p><b>Dune Protection</b></p> <ul style="list-style-type: none"> <li>• Remodel dune protection fences to accumulate wind blown sand</li> <li>• Plant new foredune with Spinifex and beach creepers.</li> <li>• Install post and rail fence on upper dune edge (Figure 6, Section 4.3.7)</li> <li>• Construct board and chain beach access track. Space boards at close interval to avoid discomfort to bare feet. Lift and maintain board and chain track as required.</li> </ul> <p><b>Revegetation</b></p> <ul style="list-style-type: none"> <li>• Replace dead and dying trees with hardy local coastal species such as Three-vein Laurel (<i>Cryptocarya triplinervis</i>), Coastal Banksia (<i>Banksia integrifolia</i>) and Tuckeroo (<i>Cupaniopsis anacardioides</i>).</li> </ul>
	<p>High</p> <p>LHRA assisted by BSC</p>
	<p>High</p> <p>LHRA</p>
	<p>High</p> <p>LHRA</p>
	<p>High</p> <p>LHRA, BSC or Labour Market Team</p>
	<p>Medium</p> <p>BSC</p>



**Plate 7: Zone 2 has a high level of use and as a result turf is in poor condition. It is recommended to lay a reinforced turf product in this area. Plate 8: Zone 2 has a high level of use and as a result turf is in poor condition. It is recommended to lay a reinforced turf product in this area.**





**Plate 9: Existing dune forming fences require reconstruction to assist accumulation of wind blown sand.**



**Plate 10: New dune forming fences will extend a further 10 metres seaward to enable dunes to build up and to direct pedestrian traffic.**



**Plate 11: Shower area in Zone 2.**



**Table 3: Recommendations Seven Mile Beach - Precinct 2 - Zone 3**

<p><b>Zone 3</b>  <b>Lennox St to Foster Street</b>  The incipient dune is much broader in Zone 3. It is well covered with Spinifex which is playing a role in sand accretion.</p> <p>Spinifex is unable to establish where stormwater pipes emerge from the dune and where the beach end of access tracks fail to direct foot traffic (Plates 11 &amp; 12).</p> <p>The frontal dune is self managing but lacks species diversity.</p> <p>Little pedestrian impact occurs as long grass that serves as a deterrent to walkers (Plate 13).</p> <p>Trees throughout the hind dune area are very aged and lack vigour with the exception of Pandanus and Norfolk Pines (Plate 14).</p>	<p><b>Stormwater management</b></p> <ul style="list-style-type: none"> <li>• Extend stormwater pipes seaward to reduce impacts of storm water on foredune. Incorporate rubbish collecting devices on outlet.</li> </ul> <p><b>Tracks and Fencing</b></p> <ul style="list-style-type: none"> <li>• Construct formalised beach access tracks to service each carpark area.</li> <li>• Tracks are likely to be board and chain construction.</li> <li>• It is important that fencing lining the track extends seaward far enough to take users beyond the incipient dune zone.</li> </ul> <p><b>Revegetation and Weed Control</b></p> <ul style="list-style-type: none"> <li>• Remove dead or unsound trees and plant replacement semi-advanced stock.</li> <li>• In addition, plant in close proximity to trees in decline.</li> <li>• Provide tree guards until plants have a diameter at breast height of 450mm.</li> <li>• Avoid further use of Norfolk Pines.</li> <li>• Spray out strips of long grass and plant Coastal Wattle (<i>Acacia sophorae</i>), start with an edge that will define mowing operations and then annually plant more Coastal Wattle until the incipient dune is reached.</li> </ul>	<p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p>	<p>BSC</p> <p>LHRA</p> <p>BSC</p> <p>Lennox Head Landcare (LHL)</p>
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**Plate 12: Spinifex is unable to establish at the end of beach access tracks. Formalising access with fencing lining the track and extending the fence seaward to take users beyond the incipient dune area is recommended.**



**Plate 13: Long grass deters walkers from this area.**



**Plate 14: Trees in the hind dune area are old and lack vigour with the exception of Norfolk Pines and Pandanus.**



**Plate 15: Dead trees should be removed and replaced with semi-advanced local native plants. Avoid further use of Norfolk Pines.**



**Table 4: Recommendations Seven Mile Beach - Precinct 2 - Zone 4**

<p><b>Zone 4.</b>  <b>Foster St to Williams St.</b>  The incipient dune is in good condition and is well swathed in Spinifex.</p> <p>Some large gardens have been established in the past on the hind dune area. These require maintenance as they are currently overrun by grasses and contain a high proportion of invasive species including Madeira Vine, Asparagus Fern and Spanish Bayonet (<i>Yucca aloifolia</i>) (Plate 15).</p> <p>Native trees such as Banksia, that appear sporadically on the hind dune, are very old and are senescing.</p> <p>Much of this zone lacks an established north-south track. As a result walkers use either one of a number of narrow 'goat tracks' through long grass or walk on the road or beach.</p> <p>Bitou Bush infestation on the frontal dune increases towards Williams Street.</p>	<p><b>Garden Beds</b></p> <ul style="list-style-type: none"> <li>Define garden perimeters with hard edging, (rail sleepers) or with <i>Lomandra hystrix</i> plantings</li> <li>remove grasses and weed species,</li> <li>prune shrubs for health,</li> <li>supplement plantings with salt tolerant non-invasive species. and</li> <li>fertilise and mulch completed beds.</li> </ul> <p><b>Revegetation and Weed Control</b></p> <ul style="list-style-type: none"> <li>Replace dead and dying trees with hardy local coastal species such as Three-vein Laurel (<i>Cryptocarya triplinervis</i>) Banksia integrifolia and Tuckeroo (<i>Cupaniopsis anacardioides</i>) and protect these with tree guards until well established (diameter at breast height 450mm). Maintain traditional views.</li> <li>Spray out strips of long grass and plant Coastal Wattle. Start with an edge that will define mowing operations and then annually plant more Coastal Wattle until the incipient dune is reached.</li> <li>Treat Bitou and carry out further planting of <i>A. sophorae</i> to replace.</li> </ul> <p><b>Tracks</b></p> <ul style="list-style-type: none"> <li>The current beach access track in this zone is considered adequate and will not require upgrading.</li> </ul>	<p>Low</p> <p>Medium</p> <p>Medium</p> <p>Low</p> <p>Medium</p>	<p>LHRA, BSC or Labour Market team</p> <p>BSC assisted by LHL</p> <p>LHL</p> <p>LHL</p>
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**Plate 16: Spanish Bayonets (*Yucca aloifolia*) are recommended for removal.**

**Table 5: Recommendations Seven Mile Beach - Precinct 2 - Zone 5**

<p><b>Zone 5.</b> <b>Williams St to Ross St</b> Small windshorn remnants of regrowth littoral rainforest (classified by Specht and Specht (1990) as Alliance V, Suballiance 17) can be seen in this zone (Plate 16). Littoral Rainforest is listed by the NSW Government as an Endangered Ecological Community (EEC) (Appendix 6)</p> <p>These remnants are dominated by <i>Cupaniopsis anacardioides</i>, <i>Alectryon coriaceus</i> and <i>Acronychia imperforata</i> and are surviving due to their intact canopy.</p> <p>Refer to Appendix 7 for Bush Regenerators Checklist which must be used when working in an EEC. Workers must be licenced by DEC to work in this community. (Appendix 6 &amp; 7 )</p> <p>Threats to remnants include competition from weeds such as Ground Asparagus and Turkey Rhubarb (Plate 17), inappropriate usage such as carparking in their shade and natural senescence.</p> <p>The native water vine (<i>Cissus antarctica</i>) is dominating the site and should be thinned.</p> <p>The topography in this zone provides opportunities for wind protected planting that will extend the edge of, and ideally link, these remnants (Plate 18).</p> <p>The beach access tracks, opposite the shop and leading from the carpark opposite Ross Street, receive high use and should be formalized to minimize further erosion (Plate 19).</p> <p>Water flow from the stormwater drain prevent the establishment of vegetation in front of the pipe. The gardens to the west of the Ross Street carpark require weed control, replanting, mulching and programmed maintenance.</p>	<p><b>Littoral Rainforest Protection</b> <b>Weed Control and Revegetation</b></p> <ul style="list-style-type: none"> <li>• These areas have survived thus far due to the protection afforded by the existing foredune. This protection must be maintained and ideally supplemented through the planting of endemic trees and shrubs, such as <i>Banksia integrifolia</i>, <i>Acacia sophorae</i> and littoral rainforest species.</li> <li>• Bitou Bush is performing a role in wind protection and should not be removed until new plantings are established.</li> <li>• Plant the strip between the remnants and the seaward Bitou Bush. This area is not extensively used by the public.</li> <li>• Weed species in the understorey (such as <i>Asparagus aethiopicus</i>) should be removed to allow germination of native seedlings (refer to Appendix 4 &amp; 5 for specific control methods).</li> <li>• Consideration should be given to linking these three areas together through planting to increase remnant resilience.</li> </ul> <p><b>Beach Access and Car Parking</b></p> <ul style="list-style-type: none"> <li>• Careful design could still allow pedestrian beach access ultimately beneath a canopy of trees.</li> <li>• If car parking is occurring beneath the canopy install road side bollards to prevent car access.</li> <li>• Existing beach access ways should each be repaired and supplemented with regulatory and educational signage, bins, and showers or taps.</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>• It is recommended that stormwater drains be extended out further to allow the accumulation of sand and revegetation of the dune building fences should be built on each side.</li> <li>• Residents should be encouraged (via letter box drops, newsletters, posters, media articles etc.) to care for these remnants as a protective asset between themselves (and their property) and the ocean.</li> <li>• Carry out regular maintenance on car park gardens.</li> </ul>	<p>High</p> <p>High -in progress</p> <p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>Low</p> <p>Medium</p>	<p>LHL</p> <p>LHL</p> <p>LHL</p> <p>BSC</p> <p>BSC</p> <p>BSC</p> <p>BSC</p> <p>BSC or LHRA</p> <p>BSC or LHRA</p>
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**Plate 17: Small windshorn remnant of littoral rainforest in Zone 5.**



**Plate 18: Fruiting Turkey Rhubarb has climbed a Banksia in Zone 5. Control is required to prevent further infestation through wind blown seed.**





**Plate 19: This area in Zone 5 is suitable for planting. It is not used for recreation and plantings will provide protection for existing remnant vegetation.**



**Plate 20: This high use area is Zone 5 has no facilities. A table could possibly be constructed on the turf area.**



**Plate 21: Water flow from the stormwater drain prevents the establishment of vegetation in front of the pipe. It is recommended that stormwater drains be extended out further to allow the accumulation of sand and revegetation of the dune. Ideally, a rubbish catching device will be incorporated into the design.**

## **4.2 Vegetation Management**

### **4.2.1 Plant Selection Guidelines**

Seven Mile Beach has a low potential to naturally regenerate. Areas cleared of Bitou Bush will need to be planted with local native replacement species. Care should be taken to use appropriate species that has been grown from seed collected nearby. Many species, such as *Banksia integrifolia*, have a very broad geographic range but genetic differences are found across this range. Trees found on the site have adapted to the specific conditions that occur at Seven Mile Beach.

The introduction of species that would not naturally occur on this site is not recommended. This can be detrimental to the ecological functions of the vegetation community. If the aims of the restoration project are to facilitate the establishment of the pre-existing vegetation, then planting trees that do not belong will detract from achievement of this aim.

### **4.2.2 Bitou Bush Control**

Bitou Bush (*Chrysanthemoides monilifera* subsp. *rotundata*) is a highly invasive introduced species that poses a major threat to coastal ecosystems. Bitou Bush is a native of South Africa. It grows on sand dunes and forest margins near beaches and poses a serious threat to native sand dune vegetation (Harden, 1992, p.315). These plants can invade and overwhelm all plant communities on the coastal system, growing in the open or in the shade of other plants. There is increasing evidence that long-term domination of coastal frontal dunes by Bitou Bush leads to instability and increased erosion (Stanley et. al., 1989).

Bitou Bush was introduced to New South Wales by the Soil Conservation Service and by sand mining companies involved in revegetation of dunes following mining operations. Bitou Bush has been recorded on 900 kilometres (80%) of the NSW coastline and is the dominant plant on 400 kilometres (NSW NPWS, 2001).

Bitou Bush is categorized as one of the top 20 environmental weeds in Australia. Bitou Bush was declared a Weed of National Significance W3 noxious weed on all coastal land of NSW on March 24, 1998. W3 weeds must be prevented from spreading and numbers reduced. In 1999 Bitou Bush was listed as a Key Threatening Process to Biodiversity in NSW and as a Weed of National Significance (Vranjic, 1999). Bitou control works will be in line with the NSW Threat Abatement Plan (draft) *Invasion of Native Plant Communities by Bitou Bush / Boneseed*. (DEC 2004).

Bitou Bush primarily spreads by seed, with germination promoted by fire or soil disturbance. Mature plants resprout after fire and slashing. Mature plants produce up to 50,000 seeds per plant per year with the seed ripening from June to September. Foxes and birds eating seeds can disperse them over several kilometres. The soil seed bank is large (up to 5000 seeds per square metre), seed viability is generally low (2 – 30%) and considerably reduced after 2 to 4 years (Vranjic, 1999).

Strategic control of Bitou Bush and replacement with Banksia dominated vegetation and littoral rainforest will assist a range of local native plant and animal species, including threatened species.

Fauna that would benefit from restored native plant communities include the Common Blossom Bat (*Banksia*), Black Flying Fox, Eastern Long-eared Bat (*Banksia* and littoral rainforest), Barred Cuckoo Shrike (small leaved figs/littoral rainforest), White-eared Monarch (littoral rainforest), Rose-crowned Fruit Dove (littoral rainforest). Birds including the Little Tern, Pied Oystercatcher and Beach Stone Curlew who's breeding habitat is on frontal dunes and sand spits would also have improved habitat following systematic and incremental control of Bitou Bush and replacement with local native plant communities.

Threatened plants that would benefit from Bitou Bush control include *Acronychia littoralis*, *Cryptocarya foetida*, *Archidendron hendersonii*, *Xylosma terrae-reginae* and *Sophora tomentosa* (although no current records for Ballina's coast, could have been present prior to sand mining). To a lesser degree the following species also suffer negative impacts due to the spread of Bitou Bush; *Endiandra muelleri* subsp. *bracteata*, *Endiandra floydii*, *Harnieria hygrophiloides*, *Melicope vitiflora*, *Grevillia hilliana*, *Syzygium moorei*, *Geodorum densiflorum*, *Niemeyera chartacea*, *Cordyline congesta* and *Monococcus echinophorus*.

Bitou Bush control and restoration of native vegetation communities can make a significant contribution to reversing threats to threatened species. Bitou Bush control involves a range of techniques for a variety of situations. Techniques include manual, biological and chemical controls.

In sandy soils seedlings and small plants are easily removed by hand. This method is time consuming and only practical on a small scale. Attempting to remove advanced plants manually will result in undue soil disturbance.

Glyphosate is the most widely used herbicide for chemical control of Bitou Bush. Application methods include cut, scrape and paint, knapsack spraying and aerial spraying. Aerial spraying (at concentration of 1:200) is most effective in winter. This provides effective treatment of broad infestations in a cost-effective manner. Most native species are not sensitive to such low concentrations of Glyphosate.

A number of biological agents have been used to assist in the control of Bitou Bush. Seven insect species have been released in Australia including moths, beetles and seedflies. Other potential biological controls include a rust fungus, and mite. Biological control will reduce but not eradicate Bitou Bush. Their use should be combined with an integrated control program along with strategic herbicide use (Holtkamp, 1997 in James, 2002).

### **4.3 Other Issues**

#### **4.3.1 Aboriginal Relics**

Consultation with the Department of Environment and Conservation, Northern Rivers Region Sites Officer (6627 0205) should occur prior to undertaking works to determine if any identified sites/objects have been recorded under the Aboriginal Heritage Information System and to determine subsequent management/consultation requirements to ensure their protection. Training should be pursued for supervising



regenerators in the identification of Aboriginal sites/objects that may be inadvertently uncovered during works.

It is possible that Dunecarers or other workers may uncover Aboriginal cultural materials and evidence of past habitation. While little disturbance will accompany the proposed works, artefacts or shell middens could be encountered during restoration works. If this occurs, works at or adjacent to the site must stop and the Regional Archaeologist, Coffs Harbour or the Sites Officer Alstonville be notified immediately. It is an offence against the NSW NPWS Act 1974 (Section 90:1) for a person who, without obtaining the consent of the Director General, knowingly destroys, defaces or knowingly causes or permits destruction or defacement or damage to a relic or Aboriginal place.

#### **4.3.2 Fauna**

Snakes, ticks, ants, mosquitoes and chiggers (the larval mites that cause “scrub itch”) can potentially cause discomfort, disease and serious illness. The best way to avoid complications is to minimise the risk of bites. Always wear protective clothing i.e. long sleeves and trousers tucked into sturdy boots, socks and a hat. Apply repellent (particularly one containing pyrethrins/DEET/triclosan antiseptics) to skin and clothing, and always take repellent and a comprehensive first aid kit into the field. Lignocaine gel can give localized relief from bites. Ticks should be killed before removal (by directly applying repellent), as the shock of physical removal can stimulate them to release more toxin into their host.

#### **4.3.3 Signage**

Most signage is used to enhance public safety, to control undesirable behaviour or to educate the community by raising awareness and understanding. Unnecessary signage is poor signage (Coastal Dune Management Manual. 2001).

Signage can be a useful way to advertise stewardship of an area and to guide behaviour. It can also be used to raise awareness of issues and to interpret interesting natural features. Signs should be durable and aesthetically in keeping with the surrounds in which they will be positioned. Messages should be positive and ideally give reasons why an activity is undesirable for an area. For example: *Erosion prone area under repair please do not enter* rather than *Keep Out!*

A Dunecare group may start off with one sign advertising the group but be aware that different sponsoring agencies and labour market programs may also want to advertise their involvement. For this reason, placement of the initial sign should be assessed for its ability to “carry” a number of others without becoming an eyesore. Separate council consent will be required for signage.

If interpretative information is to be included in the display, the construction of a purpose built structure such as used by NPWS needs to be considered. Design the displays so as to allow a change of photos and maps as they discolour and fade. Many different materials and styles are available for signs. For those placed permanently, they need to be robust, durable and attractive. Hardwood signs with routed lettering used by NPWS best meet this criterion. For temporary signs such as might be used to advertise working bees, spray activities or temporary track closures, lightweight polyflute signs with laser-cut lettering are the most appropriate. These are available from your local sign writer.

Note that consent to erect permanent signs will be required from Ballina Shire Council and may entail the preparation of a Development Application.

Further discussion on signs is available in the following publications.

Kidd, R. 2001. *Coastal Dune Management*. NSW Department of Land and Water Conservation.

NPWS. (nd). *Signage Design Standards*. NSW National Parks and Wildlife Service, Sydney.

Gorrell, S. (nd). *Walking Track Construction Guidelines*. NSW National Parks and Wildlife Service, Sydney.

#### **4.3.4 Community Education**

Swimmers, surfers (including competition organisers and competitors), adjacent home owners, walkers, locals and visitors who use Seven Mile beach require sustained community education. Regeneration workers can provide important information by explaining the value of the work being conducted through a possible brochure or leaflet. This could be distributed through local shops and dropped in letterboxes of adjacent homes.

#### **4.3.5 Rubbish Dumping**

Dumping of rubbish and garden waste is a problem in most natural areas. It is also one of the main ways that exotic plants are introduced in vegetation remnants. Explanatory signage and personal communication with anyone observed dumping may discourage the practice, and always remove any rubbish encountered when working.

#### **4.3.6 Dogs**

Dogs are permitted on the beach if on a leash. The nearest leash free area is north of Lake Ainsworth.

#### **4.3.7 Dune Reconstruction and Protection**

Beach erosion is a natural and dynamic process that is often hastened by misuse of the dunes. Beach users can cause erosion by developing informal tracks or sliding down and digging into dune scarps. If an area is obviously being used in this manner, it may be worth fencing or brush matting the spot to discourage the practice. Explanatory signage may also prove useful. Areas where blowouts are developing will require rehabilitation works.

The following information has been summarised from NSW Department of Land and Water Conservation, 2001 *Coastal Dune Management: A Manual of Coastal Dune Management and Rehabilitation Techniques*. Coastal Unit, DLWC, Newcastle. For further details on this topic and specific designs for a range of fences and pathways, it is recommended to refer directly to this manual.

The aim of dune rehabilitation is to try to establish a landscape that resembles, as closely as practical, the dunes that were present before the degradation began. At some sites, erosion or other damage may have been so severe that the first task is to reshape the sand mass into a landform that might have been expected to develop naturally. At other sites the dunes may not have suffered erosion and degradation may be limited to invasion by weeds. Variation in visitation levels affect the type and level of control structures that may be needed, such as fencing, accessways and signage.

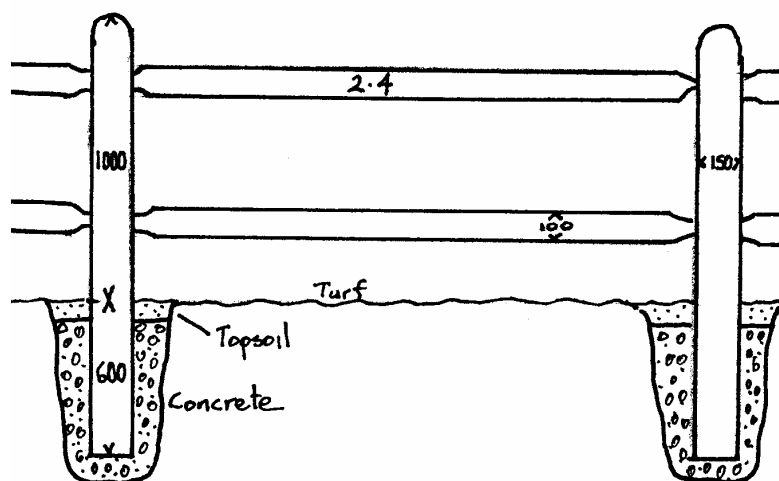
##### *Dune forming fences*

The principal function of a dune-forming fence is to reduce the wind velocity, thereby causing drift sand to be deposited in the vicinity of the fence (Figure 9). This technique can be used for small blowouts, larger scale dune formation and at sites where it is not feasible to import new material. Dune forming fences are most commonly made of a porous material such as a woven synthetic cloth. This material is attached to plain wire strained between treated pine posts. Accumulated sand may require revegetation to assist in stabilising areas. To build up dune height, additional fences may need to be constructed above the original fence when they have filled with sand (Figure 10). This should be repeated until the height of the sand trapped by the dune fences approximated the height of the surrounding dunes ((NSW DLWC, 2001 *Coastal Dune Management – A Manual of Coastal Dune Management and Rehabilitation Techniques*).

### *Protective fencing*

Dune vegetation is particularly susceptible to damage from pedestrian and vehicular traffic. Fences are therefore used in the dune areas to preserve both revegetated and naturally vegetated areas. Two major fence lines are generally used in dune rehabilitation projects, one along the seaward margin of the dune field, and other landward fence that protects hind dune areas.

Designated accessways provide controlled opportunities for beach users to cross the dune and these are also usually fenced. Fencing on either side of accessways is used to control traffic. If access is not confined to tracks, significant damage can occur to both mature and establishing vegetation. All accessways require regular maintenance so that they continue to function correctly and do not become a hazard to the public.

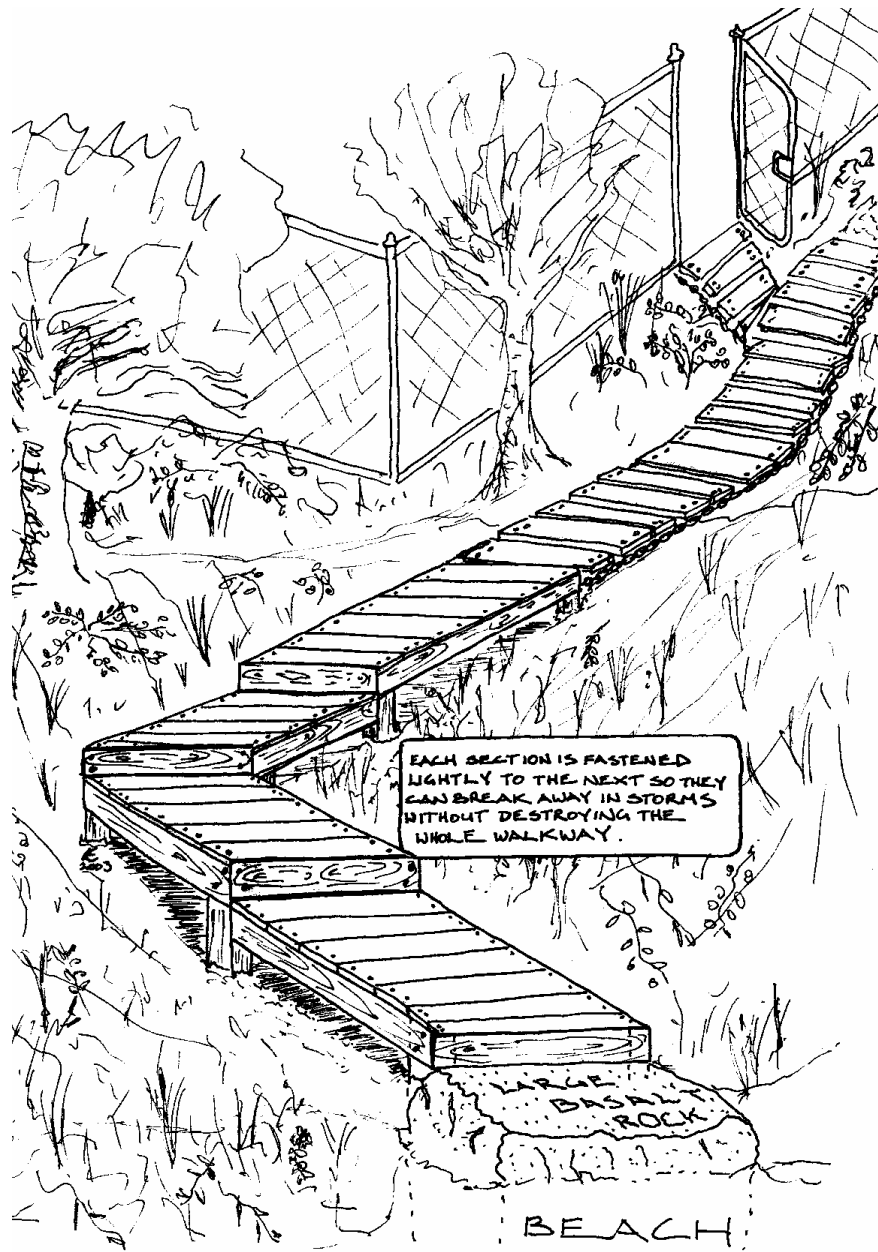


**Figure 6: Construction detail of post and rail fence.**

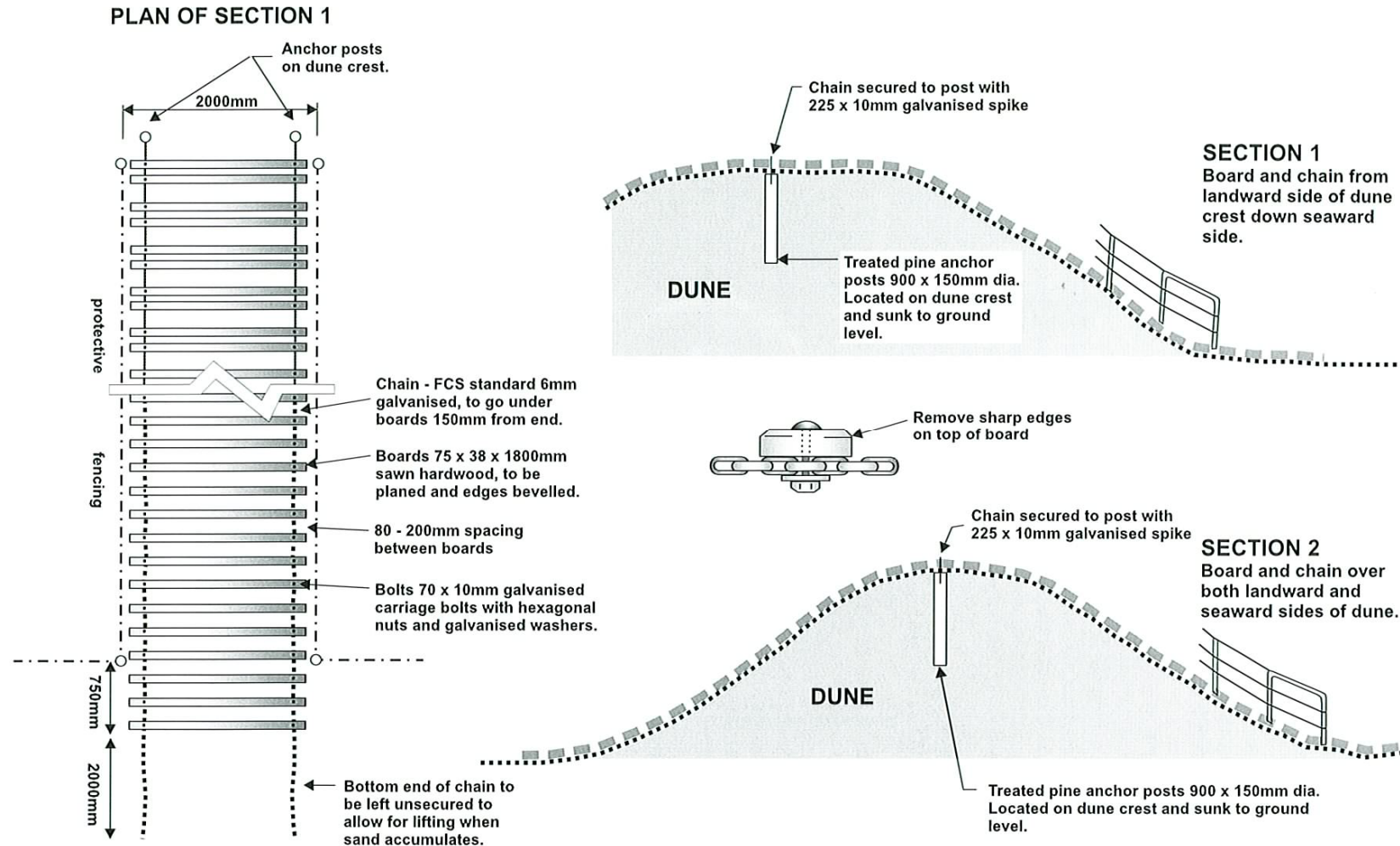


### *Tracks*

There is no standard way to build a beach access track, each case must be considered for orientation, slope, rate of erosion and underlying material. An example is shown of a design for a particular situation at Byron Bay (Figure 7). This design incorporates a series of sections of walkway. Each section is lightly fastened to the next so that in the case of high seas the sections can break away without destroying the entire walkway. Design of a pedestrian board and chain walkway is illustrated in Figure 8.



**Figure 7: Example of track design. A variety of design options are possible to suit a range of situations.**



**Figure 8: Pedestrian board and chain walkway (NSW DLWC, 2001 *Coastal Dune Management – A Manual of Coastal Dune Management and Rehabilitation Techniques*).**

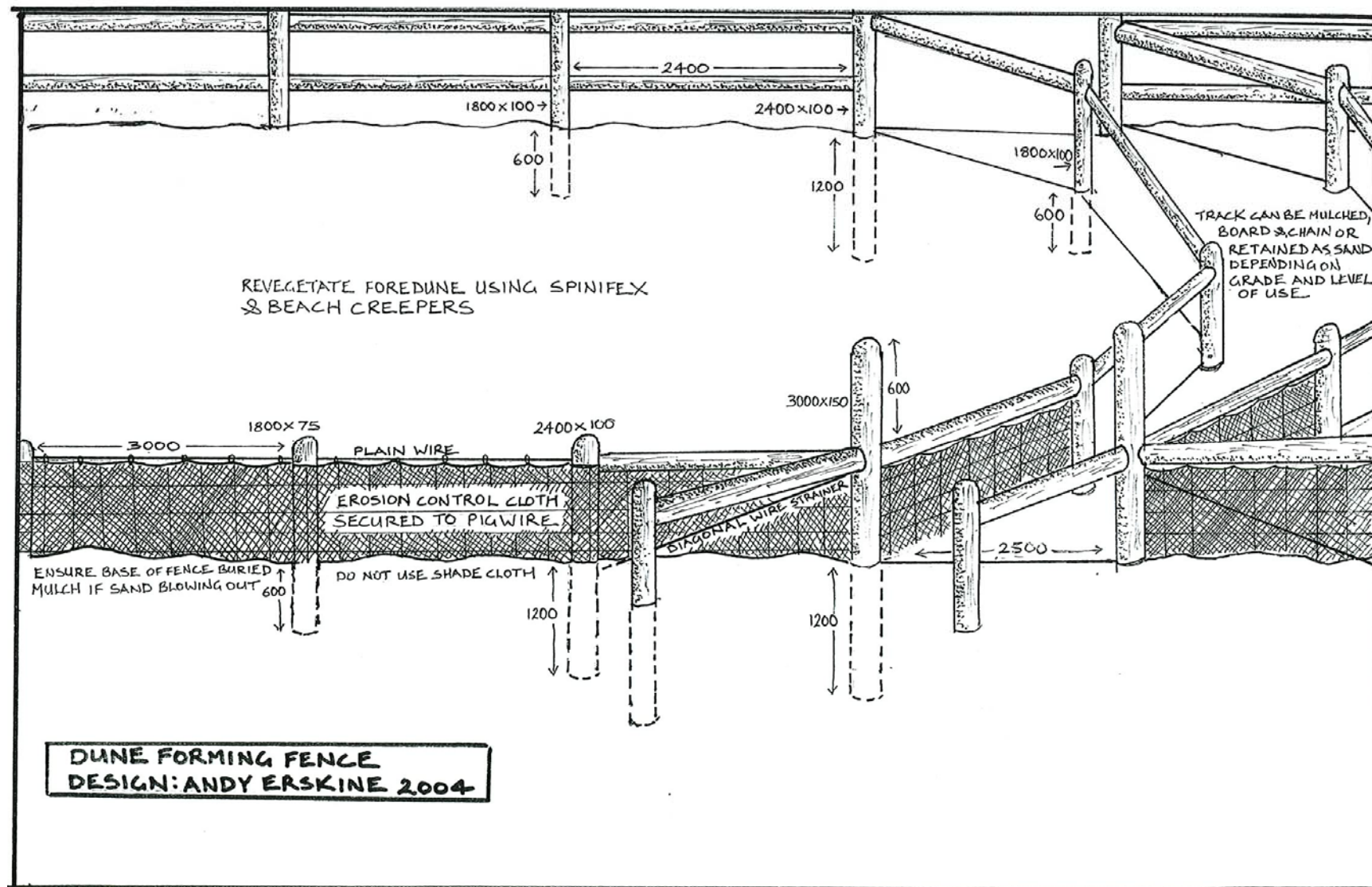
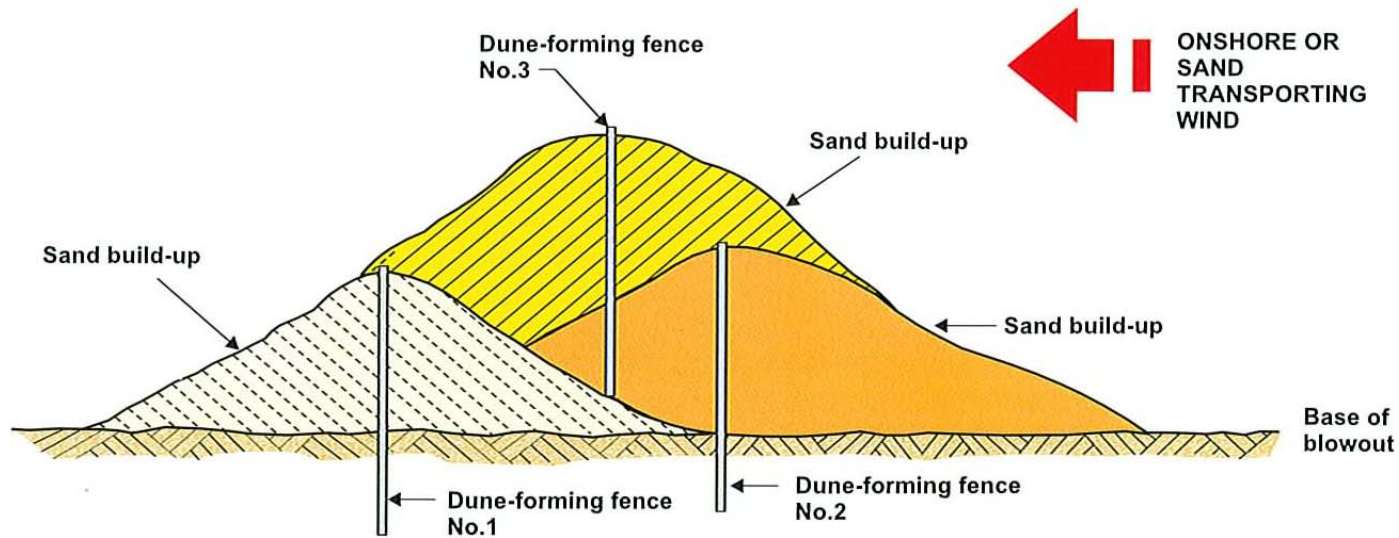


Figure 9: Dune forming fence design



**Figure 10: Sequence for progressive installation of dune forming fences (NSW DLWC, 2001 *Coastal Dune Management – A Manual of Coastal Dune Management and Rehabilitation Techniques*).**



## 5. MONITORING

### **Formal monitoring, performance indicators**

It is important to monitor the project through “before and after” photography. This provides a record of progress that will prove useful to attract further funding and identify successful techniques, as well as providing reassurance to volunteers that their work has been useful. The slow success of rehabilitation works is best seen when specific photo points are established during the initial stages of the project and continually used.

Photo points should be identified with a permanent marker (some sort of stake or picket) and taken consistently of the same site from the same direction. This can be established by referring to past photos prior to taking each photo. Photographic records should be taken at least seasonally (i.e. three to six monthly) and after major events, such as big plantings, storms or fires.

Records of working bees, including attendance, activities undertaken, weather constraints, successes and failures etc. are also invaluable monitoring tools. An example of a work record sheet is included as Appendix 7.

Another important aspect of monitoring is maintaining species lists. The flora and weed lists in this plan (Appendices 1 and 2) should be continually updated as new species are encountered. It is also useful to establish a fauna species list for the site, particularly as the site provides habitat for a threatened species (the Little Tern and Osprey). This information should be shared with land managers such as Ballina Shire Council, the Department of Infrastructure, Planning and Natural Resources and the NPWS.

## 6. CONCLUSION

The Seven Mile Beach (Precinct 2) Beachfront Management Plan details strategies, methods and a work program for restoration of coastal dune vegetation and for provision of appropriate public facilities at Pacific Parade, Seven Mile Beach, Lennox Head.

The plan assesses the condition and regeneration potential of existing native vegetation. It provides information on weed species, weed control and vegetation restoration techniques. Works aim to minimise the impact of erosion through strengthening dunes and provision of appropriate stormwater management, beach access and facilities. The plan will contribute to increased public awareness of the importance of coastal vegetation and encourage local stewardship for the area.

The beaches of Ballina Shire contribute significantly to the areas natural beauty and attraction to locals and visitors. Coastal vegetation should be recognised as a major asset, not only as a backdrop to beaches, but as a dynamic living ecosystem that offers habitat to native plants and wildlife and serves as a buffer from the ravages of storms.

Implementation of systematic vegetation restoration works, as detailed in this plan, will assist in building our natural assets for the future.

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**APPENDIX 1: Native Plant Species List****Grasses and Groundcovers**

Family	Scientific name	Common name	Zones				
			1	2	3	4	5
Fabaceae	<i>Carnivalia rosea</i>	Beach Bean	x	x	x	x	x
Aizoaceae	<i>Carpobrotus glaucescens</i>	Native Pigface				x	x
Commelinaceae	<i>Commelina cyanea</i>	Blue Commelina				x	x
Liliaceae	<i>Crinum pedunculatum</i>	Swamp Lily	x				x
Phormiaceae	<i>Dianella crinoides</i>	Flax Lily			x	x	x
Poaceae	<i>Imperata cylindrica</i>	Bladey Grass			x	x	x
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Goats Foot			x	x	x
Cyperaceae	<i>Isolepis nodosus</i>	Knobby Clubrush	x	x	x	x	x
Lomandraceae	<i>Lomandra longifolia</i>	Mat Rush					x
Asteraceae	<i>Melanthera biflora</i>	Melanthera	x				x
Poaceae	<i>Spinifex sericeus</i>	Spinifex			x	x	x
Aizoaceae	<i>Tetragonia tetragonoides</i>	Warrigal Spinach	x		x	x	x

**Trees and Shrubs**

Family	Scientific name	Common name	1	2	3	4	5
Fabaceae	<i>Acacia sophorae</i>	Coast Wattle			x	x	x
Myrtaceae	<i>Acmena smithii</i>	Lily Pilly					x
Rutaceae	<i>Acronychia imperforata</i>	Beach Acronychia					x
Sapindaceae	<i>Alectryon coriaceus</i>	Beach Birds-eye					x
Myrtaceae	<i>Austromyrtus dulcis</i>	Midgen Berry					x
Proteaceae	<i>Banksia integrifolia</i>	Coast Banksia	x	x	x	x	x
Casuarinaceae	<i>Casuarina equisetifolia</i>	Horsetail She-oak	x	x	x	x	x
Myrtaceae	<i>Corymbia intermedia</i>	Pink Blood-wood				x	
Lauraceae	<i>Cryptocarya triplinervis</i>	Three-veined Laurel				x	x
Sapindaceae	<i>Cupaniopsis anacardoides</i>	Tuckeroo	x	x	x	x	x
Moraceae	<i>Ficus watkinsiana</i>	Strangler Fig				x	
Euphorbiaceae	<i>Glochidion sumatranum</i>	Cheese Tree					x
Sapindaceae	<i>Guioa semiglauc</i>	Guioa					x
Malvaceae	<i>Hibiscus tiliaceus</i>	Cottonwood	x			x	
Pandanaceae	<i>Pandanus tectorius</i>	Pandanus	x			x	
Myrtaceae	<i>Syzygium oleosum</i>	Blue Lily Pilly					x
Thymeleaceae	<i>Wikstroemia indica</i>	Wikstroemia			x	x	x

**Vines**

Family	Scientific name	Common name	1	2	3	4	5
Vitaceae	<i>Cayratia clematidea</i>	Slender Grape					x
Vitaceae	<i>Cissus antarctica</i>	Water Vine					x
Philesiaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily				x	x
Dilleniaceae	<i>Hibbertia scandens</i>	Guinea Flower	x		x	x	x
Smilacaceae	<i>Smilax australis</i>	Austral Sarsaparilla				x	x
Menispermaceae	<i>Stephania japonica</i>	Snake Vine	x		x	x	x



## APPENDIX 2: Weed Species List

Family	Scientific name	Common name	Zones				
			1	2	3	4	5
Polygonaceae	<i>Acetosa sagittata</i>	Turkey Rhubarb					x
Agavaceae	<i>Agave</i> sp.	Yucca			x	x	
Basellaceae	<i>Anredera cordifolia</i>	Madeira Vine				x	
Araucariaceae	<i>Araucaria heterophylla</i> *	Norfolk Island Pine	x	x	x	x	x
Asparagaceae	<i>Asparagus aethiopicus</i>	Ground Asparagus				x	x
Crassulaceae	<i>Bryophyllum pinnatum</i>	Resurrection Plant	x			x	
Asteraceae	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush			x	x	x
Euphorbiaceae	<i>Euphorbia cyathophora</i>	Painted Spurge				x	x
Moraceae	<i>Ficus elastica</i>	Rubber Tree				x	
Colchicaceae	<i>Gloriosa superba</i>	Glory Lily					
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal Morning Glory			x	x	x
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro				x	x
Davalliaceae	<i>Nephrolepis cordifolia</i>	Fishbone Fern				x	
Onagraceae	<i>Oenothera drummondii</i>	Beach Primrose					x
Cactaceae	<i>Opuntia stricta</i>	Prickly Pear				x	
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu	x	x	x	x	x
Dracaenaceae	<i>Sansaviera trifasciata</i>	Mother-in-laws Tongue				x	
Araliaceae	<i>Schefflera actinophylla</i>	Umbrella Tree				x	
Asteraceae	<i>Senecio madagascariensis</i>	Fire Weed				x	
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass	x	x	x	x	x

\* denotes natives that would not naturally occur at Seven Mile Beach

## APPENDIX 3: Weed Profiles

### TREES AND SHRUBS

#### Agavaceae

##### *Agave americana*

##### **Yucca**

A native of Mexico. A very large perennial plant with a basal rosette of fleshy leaves up to two metres long with long spines along the margins. The plant was originally introduced as an ornamental and now occurs as a garden escapee in many parts of Australia (Auld and Medd, 1992).

#### Araliaceae

##### *Schefflera actinophylla*

##### **Umbrella Tree**

Native of North Queensland and naturalised in coastal districts of northern NSW. A tree up to ten metres high, often multi-stemmed and sometimes epiphytic high in the canopy (Harden, 1992, p.87), making removal difficult. Birds disperse its red fruit. Adventitious roots form readily from stem segments that remain in contact with the ground.

#### Asteraceae

##### *Chrysanthemoides monilifera* subsp. *rotundata*

##### **Bitou Bush**

Native of South Africa. An erect, shallow-rooted, densely branched perennial shrub up to three metres high (Auld and Medd, 1992). It grows on sand dunes and forest margins near beaches and poses a serious threat to native sand dune vegetation (Harden, 1992, p.315). These plants can invade and overwhelm all plant communities on the coastal system, growing in the open or in the shade of other plants. Up to 48,000 seeds per plant can be produced with a viability of up to seven years. Fruits are attractive to birds (Buchanan, 1989). There is increasing evidence that long-term domination of coastal frontal dunes by Bitou Bush leads to instability and increased erosion (Stanley et. al., 1989). It is a declared W3 noxious weed (i.e. must be prevented from spreading and its numbers reduced).

#### Cactaceae

##### *Opuntia stricta*

##### **Prickly Pear**

Native to North and South America. A low spreading, shallow rooted perennial cactus forming large clumps up to 1.5 metres tall. It has succulent segments up to 20 centimetres long with clumps of short tufts of hair and spines. Flowers are bright yellow and fruit is dark purple (Auld and Medd, 1992). Birds disperse seeds and adventitious roots will form if segments contact the ground. It is a declared W4(f) noxious weed (i.e. cannot be sold, propagated or knowingly distributed).

### VINES AND SCRAMBLERS

#### Asparagaceae

##### *Protasparagus aethiopicus*

##### **Ground Asparagus**

Native of South Africa. A shrub with sprawling stems up to two metres long, it is extensively naturalized in coastal districts and is a serious weed of bushland (Harden, 1993, p.46). It will form a total ground cover thereby preventing any germination of native species and inhibiting those that are present. It is a prolific seeder, making eradication difficult.

#### Basellaceae

##### *Anredera cordifolia*

##### **Madeira Vine**

Native of S. America. A climber with stems up to 20 metres long, producing tubers on roots and at nodes on aerial stems. It is widely naturalized in coastal districts, and is an invasive weed on the margins of rainforest (Harden, 1990, 177). This vine is extremely prolific, growing over 1 metre per week in warm, humid conditions. It produces countless vegetative aerial tubers which drop to the ground and remain dormant if conditions are not suitable for their growth. These tubers are spread by water, downhill movement and possibly rodents. The vine will rapidly smother plants of all sizes, destroying them through weight and inhibition of photosynthesis, and can block secondary succession

(Hopkins). It is extremely difficult to control and is considered to be the most serious and destructive plant pest species affecting the North Coast rainforest remnants.

**Colchicaceae**

***Gloriosa superba***

**Glory Lily**

Perennial herb with climbing annual stems arising from rhizomes. Leaves lanceolate, flowers orange, yellow or red. Flowers October to May. Widely cultivated, occasionally naturalised in coastal districts north of Sydney. Native of Africa and Asia (Harden, 1993, p.109).

**Convolvulaceae**

***Ipomoea cairica***

**Coastal Morning Glory**

Native of tropical Africa and Asia. Perennial with twining and trailing stems. Violet to purplish violet flowers with a darker throat. Flowers throughout the year. Widely cultivated and frequently naturalised in coastal districts (Harden, 1992, p.380).

**Fabaceae**

***Macroptilium atropurpureum***

**Siratro**

Decumbent or climbing perennial, stems two to three metres long, pubescent. Leaves three-foliolate two to seven centimetres long, lower surface densely whitish pubescent. Pods linear, four to ten centimetres long, pubescent. Native of Central and North America (Harden, 1991, p.423).

**Onagraceae**

***Oenothera drumondii***

**Beach Primrose**

Perennial herb to 60 centimetres high with basal rosettes and taproot. Densely hairy, giving a grey-green appearance, with erect stem and prostrate or ascending lateral stems. Broad leaves narrow-oblongate and often shallowly lobed. Margins entire or shallowly toothed. Petals yellow becoming red with age. Flowers spring to autumn. Fruit cylindrical. Native of North America. Naturalised on coastal sands north of Sydney (Harden, 1991, p. 206).

**Polygonaceae**

***Acetosa sagittata***

**Turkey Rhubarb**

Perennial climber with stems usually greater than 100 centimetres. Inflorescences large, flower whorls few-flowered. Native of South Africa. Cultivated and naturalised especially in waste areas near towns (Harden, 1990, p. 292).

**HERBS, FERNS AND GRASSES**

**Asteraceae**

***Senecio madagascariensis***

**Fire Weed**

Annual or biennial herb, 20-60 centimetres high, mostly erect, sometimes much-branched, glabrous or sparsely hairy. Leaves variable. Flowers chiefly Spring-Autumn. Toxic to cattle and horses if eaten. Native of South Africa (Harden, 1992, p.308).

**Crassulaceae**

***Bryophyllum pinnatum***

**Resurrection Plant**

Glaucous shrub, little-branched, suckering at the base, stems cylindrical. Leaves elliptic, 5 to 25 centimetres long, crenate, lower ones simple, upper ones often pinnate. Red flowers. Escape from cultivation. Probably native of Africa (Harden, 1990, p.528).



**Dracaenaceae**

***Sansevieria trifasciata***

**Mother-in-law's Tongue**

Plant with a very short stem. Strongly stoloniferous. Leaves are dark green with conspicuous light or grayish green, irregularly defined transverse bands. Margins narrow, light green, yellow or reddish. Commonly cultivated as a house plant. Native of Africa (Harden, 1993, p.51).

**Euphorbiaceae**

***Euphorbia cyathophora***

**Painted Spurge**

Native of tropical America. An annual, erect herb, flowering most of the year. It is naturalized on coastal sands (Harden, 1990, p.425). It can form dense thickets up to 1.5 metres high (Cribb and Cribb, 1985, p.123) inhibiting native regeneration.

**Poaceae**

***Pennisetum clandestinum***

**Kikuyu**

A native of Africa. A creeping perennial grass with very long, robust stolons and rhizomes forming a mat. Kikuyu is used widely as a lawn grass and is a common pasture grass in coastal subtropical Australia (Harden, 1993, p.498).

***Stenotaphrum secundatum***

**Buffalo Grass**

Glabrous, stoloniferous perennial to 0.3 metres high. Flowers in Summer. Grows on the coast but cultivated elsewhere. Native of America and Africa (Harden, 1993, p.503).

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**Source:** adapted from Joseph, R. 1995. *Rainforest Remnants Restoration and Rehabilitation Project Incorporating Plant Pest Species Survey and Prior Works Documentation: Boatharbour Nature Reserve*. NSW National Parks and Wildlife Service, Alstonville.

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## APPENDIX 4: Weed Treatment Methods

1. **“Cut-scrape-paint”**: this method applies to all woody shrubs, trees and some vines.

- (a) Cut plant low to the ground at an angle.
- (b) Apply Glyphosate immediately at the rate of 1 part Glyphosate: 1.5 parts water, with a paintbrush approximately 1.5 centimetres wide.
- (c) Scrape sides lightly to reveal green tissue and apply the herbicide to the scraped area.
- (d) Take care that the brush is not contaminated with soil.

**Note:** all seed that has high viability and longevity, e.g. *Senna* spp. and other members of the Fabaceae family, or plants with a high invasive potential, such as *Schefflera actinophylla*, must be removed from the parent and either composted on site or removed from the site.

2. **“Gouge-paint”**: this method applies to those plant species that have a fleshy root system, such as rhizomes or large bulbs. It is particularly appropriate for the treatment of *Protasparagus* spp. (*Asparagus*).

- (a) Gouge out sections of the fleshy base with a knife (if using on *Asparagus*, first cut the stems at shoulder height and also at the base).
- (b) Apply 1 part Glyphosate: 1.5 parts water immediately, with a paint brush approximately 1.5 centimetres wide.

3. **“Stem Injection”**: this method applies to all woody trees and shrubs with a diameter of about six to ten centimetres or greater.

- (a) With a tomahawk, make a cut the width of the blade, at a slight angle, into the trunk.  
**Note:** it is important not to make cuts too deep.
- (b) Apply herbicide immediately into the cut using a tree-injecting device (if using Glyphosate, apply at the rate of 1 part Glyphosate: 1.5 parts water).
- (c) Repeat this procedure in a brickwork pattern around the circumference of the tree, as close to the ground as possible. Where the presence of a crotch angle makes this difficult, make a cut above it. **Note:** two rows of cuts will be sufficient for trees with trunks of six to ten centimetres; larger trunk diameters will need correspondingly more.
- (d) Treat all visible lateral roots as per (a).

4. **“Scrape-ditch-paint”**: this method is applicable to many species of vines where it is desirable to treat the vines intact, particularly those with aerial tubers such as *Anredera corifolia* (Madeira Vine) or those which will propagate from segments, e.g. *Delairia odorata* (Cape Ivy).

- (a) Scrape the stem tissue on one side of the stem only for at least 20-30 centimetres if possible. **Note:** on Madeira Vine, it is necessary to scrape heavily. Scrape as many sections of the stem as possible.
- (b) Apply undiluted Glyphosate with a paintbrush.
- (c) On stems that are thicker or horizontal, make a ditch into the stem with a knife and apply herbicide. Tubers and side roots should be treated the same way. **Note:** care must be taken not to sever the stem.

5. **“Spraying”**: this is carried out using a 15 litre backpack spray unit with a modified spray nozzle that gives a solid spray pattern. Glyphosate is the main herbicide used with the addition of a marker dye. For plants that show some resistance (e.g. Madeira Vine) or where growing conditions are not optimal, an acidifying agent, Protec®, is added. Metsulfuron can also be used for resistant species and grasses. It should be used with a surfactant, such as Agral®.

**Note:** where both Glyphosate and Metsulfuron are recommended for a species, it may be possible to use a commercially available compound of these two herbicides. This approach is currently under trial and is not suitable for operators unskilled in precision spraying.

**Note:** dilution rates for Glyphosate and Metsulfuron are in accordance with the manufacturer's recommendations and any variation requires a permit from the National Registration Authority.

Dilution Rates (Glyphosate: water):

- Plants with more or less succulent leaves, e.g. *Tradescantia fluminensis*, *Anredera cordifolia* (autumn to winter is the suggested time for spraying these plants), *Chlorophytum* spp. etc.  
1 part Glyphosate: 50 parts water + Protec® 0.5%
- *Lantana camara*  
1 part Glyphosate: 100 parts water
- Other soft-leaved plants, annuals and grasses  
1 part Glyphosate: 100 parts water
- *Chrysanthemoides monilifera* subsp. *rotundata*  
1 part Glyphosate: 150 parts water to 1 part Glyphosate: 400 parts water

Dilution Rates (Metsulfuron: water):

- 1.5g Metsulfuron: 10 litres water + 20 millilitres Agral®: 10 litres water

6. **“Overspray”**: this method is applicable to large, dense infestations of such plants as *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana), where it is desirable to leave the dead plants intact to prevent erosion and over-exposure of large areas, protect native seedlings from predators such as wallabies, and avoid trampling by humans.

- (a) Spray over the top of the infestation, using a weak solution of Glyphosate.

**Note:** any native plants that may be under the weed will be protected by the foliage cover of the weed.

- (b) Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.

**Note:** Lantana – 1 part Glyphosate: 100 parts water

Bitou Bush – 1 part Glyphosate: 150 parts water to 1 part Glyphosate: 400 parts water

**Alternatively:** weeds can be cut and flattened with bush-hooks or loppers and the subsequent regrowth sprayed with Glyphosate.

**Note:** in many cases it is preferable to overspray wherever practicable as this will cause less erosion and trampling of suppressed native plants, such as ferns and seedlings. However, handwork will be necessary to “cut-scrape-paint” any unsprayed Bitou Bush or Lantana that surrounds native plants.

7. **“Crowning”**: this method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems, etc. e.g. *Protasparagus* spp., *Chlorophytum comosum* and grasses).

- (a) Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first.
- (b) Insert the knife close to the base of the plant at a slight angle, with the tip well under the root system.
- (c) Cut through the roots close to the base. Depending on the size of the plant, two or more cuts may be needed to sever all the roots.
- (d) Remove the plant. Make sure that the base of the plant where the roots begin is completely removed.

Source: adapted from Joseph, R., 2001. *Course Notes from Certificate II in Bushland Regeneration*. TAFE, Wollongbar.



**APPENDIX 5: Treatment Methods for the Weeds at Seven Mile Beach****Trees and Shrubs**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Control Method</b>
<i>Agave</i> sp.	Yucca	Hand pull young plants where possible. Cut larger plants near the ground and cut-scrape-paint 1:1.5. Remove all material from site.
<i>Araucaria heterophylla</i>	Norfolk Island Pine	Do not treat.
<i>Chrysanthemoides monilifera</i> subsp. <i>Rotundata</i>	Bitou Bush	Hand pull young seedlings and hang up. Cut-scrape-paint 1:1.5 small plants. Overspray mature plants if no risk to native seedlings 1:200.
<i>Ficus elastica</i>	Rubber Tree	Stem inject 1:1.5 larger trees. Cut-scrape-paint 1:1.5 small plants. Cut material will re-shoot if left on the ground.
<i>Opuntia stricta</i>	Prickly Pear	Spray Metsulfuron 1.5g/10L and Agral® 20mL/10L. Bag seed.
<i>Schefflera actinophylla</i>	Umbrella Tree	Hand pull or spray seedlings 1:50 + Protec®. Stem inject 1:1.5 larger trees. Cut-scrape-paint 1:1.5 small plants.

**Vines and Scramblers**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Control Method</b>
<i>Anredera cordifolia</i>	Madeira Vine	Scrape as much stem as possible (on one side) and paint with 100% glyphosate, tubers: scrape/gouge and paint (100%); spray ground infestations 1:50 + Protec®. Bag tubers. Do not cut the stem.
<i>Acetosa sagittata</i>	Turkey Rhubarb	Hand remove plant and tuber. Bag tubers.
<i>Gloriosa superba</i>	Glory Lily	Hand remove plant and tuber. Bag tubers (highly poisonous). Treat in December and January when flowering.
<i>Ipomoea cairica</i>	Coastal Morning Glory	Hand pull, cut-scrape-paint 1:1.5, roll up vines, spray 1:100 + Protec®.
<i>Macroptilium atropurpureum</i>	Siratro	Hand pull, cut-scrape-paint 1:1.5. Bag seeds.
<i>Oenothera drummondii</i>	Beach Primrose	Hand remove.
<i>Protasparagus aethiopicus</i>	Ground Asparagus	Hand remove (crowning of rhizome). Spray Metsulfuron 1.5g/10L and Agral® 20mL/10L.

**Herbs, Ferns and Grasses**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Control Method</b>
<i>Bryophyllum pinnatum</i>	Resurrection Plant	Hand remove all plant parts where possible. Spray Metsulfuron 1.5g/10L and Agral® 20mL/10L.
<i>Euphorbia cyathophora</i>	Painted Spurge	Spray 1:100 + Protec®. Hand pull.
<i>Nephrolepis cordifolia</i>	Fishbone Fern	Hand remove all plant parts where possible. Spray Metsulfuron 1.5g/10L and Agral® 20mL/10L.
<i>Pennisetum clandestinum</i>	Kikuyu	Spray 1:100 + Protec®.
<i>Sansevieria trifasciata</i>	Mother-in-law's Tongue	Hand remove all plant parts where possible. Spray Metsulfuron 1.5g/10L and Agral® 20mL/10L.
<i>Senecio madagascariensis</i>	Fireweed	Hand pull.
<i>Stenotaphrum secundatum</i>	Buffalo Grass	Spray 1:100 + Protec®.

Note: Unless otherwise stated the herbicide recommended for the techniques described above is Glyphosate e.g. Roundup®. Protec® should be used as per manufacturer's instructions. An off label permit is required from the National Registration Authority for any combination of herbicides or for rates not described on the product labels.

## APPENDIX 6: Littoral Rainforest Endangered Ecological Community Listing

### Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

#### NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence, to omit reference to the Sutherland Shire Littoral Rainforest from Part 3 of Schedule 1 (Endangered Ecological Community) of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia*, *Eucalyptus botryoides* and *E. tereticornis* occur in many stands. Littoral Rainforest in NSW is found at locations along the entire NSW Coast in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. The areas mapped for inclusion in State Environmental Planning Policy 26 Littoral Rainforest are examples of the Littoral Rainforest ecological communities, but the mapping for SEPP 26 is not exhaustive and stands of the Littoral Rainforest ecological community occur at locations not mapped under SEPP 26. Some stands may be regrowth or in the process of regenerating. The Sutherland Shire Littoral Rainforest Endangered Ecological Community which was previously listed as an endangered ecological community is included within this Community.
2. Littoral rainforest occurs on both sand dunes and on soils derived from underlying rocks (McKinley *et al.* 1999). Stands on headlands exposed to strong wind action may take the form of dense windpruned thickets (for example the Bunga Head Rainforest illustrated by Keith & Bedward 1999, or MU5 Littoral Windshear Thicket in NPWS 2002). In more sheltered sites, and in hind dunes, the community is generally taller, although still with wind pruning on the windward side of stands. Floristically there is a high degree of similarity between stands on different substrates. Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.
3. Littoral Rainforest comprises the *Cupaniopsis anacardioides* – *Acmena* spp. alliance of Floyd (1990). This alliance as described by Floyd includes five sub-alliances – *Syzygium luehmannii* – *Acmena hemilampra*, *Cupaniopsis anacardioides*, *Lophostemon confertus*, *Drypetes* – *Sarcomelicope* – *Cassine* – *Podocarpus* and *Acmena smithii* – *Ficus* – *Livistona* – *Podocarpus*. The distribution of some of these sub-alliances is geographically restricted – the *Syzygium luehmannii* – *Acmena hemilampra* sub-alliance is restricted to the north coast, while the most widespread sub-alliance *Acmena smithii* – *Ficus* – *Livistona* – *Podocarpus* is the only one present on the coast south of Sydney. The *Lophostemon confertus* suballiance, synonymous with Forest Type 25 Headland Brush Box (Forestry Commission of NSW 1989) is restricted to exposed headlands in the North Coast Bioregion. There is considerable floristic variation between stands and in particular areas localised variants may be recognised (for

example on the south coast a number of variants within the *Acmena smithii* – *Ficus* – *Livistona* – *Podocarpus* sub-alliance have been described, see Mills 1996, Mills & Jakeman 1995; Keith & Bedward 1999, NCC 1999, NPWS 2002). Small, depauperate stands may be difficult to assign to sub alliances. A number of species characteristic of Littoral Rainforest in NSW reach their southern limits at various places along the coast (for example *Cupaniopsis anacardioides* reaches its southern limit between Sydney and the Illawarra) but a number of temperate species are restricted to the south coast, and the total Littoral Rainforest flora declines from north to south. Characteristic species of littoral rainforest include:

<i>Acacia binervata</i>	<i>Acmena hemilampra</i>
<i>Acmena smithii</i>	+ <i>Acronychia imperforata</i>
<i>Acronychia oblongifolia</i>	+ <i>Alpinia caerulea</i>
<i>Alectryon coriaceus</i>	<i>Alyxia ruscifolia</i>
+ <i>Aphananthe philippinensis</i>	+ <i>Archontophoenix cunninghamiana</i>
<i>Arthropteris tenella</i>	+ <i>Arytera divaricata</i>
<i>Asplenium australasicum</i>	+ <i>Baloghia marmorata</i>
<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	+ <i>Beilschmiedia obtusifolia</i>
<i>Breynia oblongifolia</i>	+ <i>Bridelia exaltata</i>
+ <i>Calamus muelleri</i>	<i>Canthium coprosmoides</i>
+ <i>Capparis arborea</i>	<i>Cayratia clematidea</i>
<i>Celtis paniculata</i>	<i>Cissus antarctica</i>
<i>Cissus hypoglauca</i>	<i>Cissus sterculiifolia</i>
<i>Claoxylon australe</i>	+ <i>Cordyline congesta</i>
+ <i>Cordyline stricta</i>	<i>Cryptocarya glaucescens</i>
<i>Cryptocarya microneura</i>	+ <i>Cryptocarya triplinervis</i>
<i>Cupaniopsis anacardioides</i>	<i>Cynanchum elegans</i>
<i>Dendrocnide excelsa</i>	+ <i>Dendrocnide photinophylla</i>
<i>Dioscorea transversa</i>	<i>Diospyros australis</i>
<i>Diospyros pentamera</i>	<i>Doodia aspera</i>
<i>Duboisia myoporoides</i>	+ <i>Dysoxylum fraserianum</i>
<i>Ehretia acuminata</i>	+ <i>Elaeocarpus obovatus</i>
+ <i>Elattostachys nervosa</i>	<i>Endiandra discolor</i>
<i>Endiandra sieberi</i>	<i>Eucalyptus botryoides</i>
<i>Eucalyptus tereticornis</i>	<i>Eupomatia laurina</i>
<i>Eustrephus latifolius</i>	<i>Ficus coronata</i>
<i>Ficus obliqua</i>	<i>Ficus rubiginosa</i>
+ <i>Ficus watkinsiana</i>	<i>Flagellaria indica</i>
<i>Geitonoplesium cymosum</i>	<i>Glochidion ferdinandi</i>

<i>Glycine clandestina</i>	+	<i>Gossia bidwillii</i>
<i>Guioa semiglauc</i>	+	<i>Ixora beckleri</i>
+ <i>Jagera pseudorhus</i>	+	<i>Lepidozamia peroffskyana</i>
<i>Litsea reticulata</i>		<i>Livistona australis</i>
<i>Lomandra longifolia</i>	+	<i>Lophostemon confertus</i>
<i>Maclura cochinchinensis</i>	+	<i>Mallotus philippensis</i>
<i>Melaleuca quinquenervia</i>		<i>Melicope micrococca</i>
+ <i>Melicope vitiflora</i>	+	<i>Mischocarpus pyriformis</i>
+ <i>Monococcus echinophorus</i>	+	<i>Morinda jasminoides</i>
+ <i>Mucuna gigantea</i>		<i>Myoporum acuminatum</i>
<i>Notelaea longifolia</i>	+	<i>Olea paniculata</i>
<i>Oplismenus imbecillis</i>	+	<i>Pandanus pedunculatus</i>
<i>Pandorea pandorana</i>		<i>Pararchidendron pruinsum</i> var. <i>pruinsum</i>
<i>Parsonsia straminea</i>	+	<i>Pentaceras australis</i>
<i>Piper novae-hollandiae</i>	+	<i>Pisonia umbellifera</i>
<i>Pittosporum multiflorum</i>		<i>Pittosporum undulatum</i>
<i>Platycerium bifurcatum</i>		<i>Podocarpus elatus</i>
<i>Polia crispa</i>		<i>Polyscias elegans</i>
<i>Pouteria australis</i>		<i>Pouteria cotinifolia</i> var. <i>cotinifolia</i>
+ <i>Pouteria myrsinoides</i>		<i>Rapanea variabilis</i>
<i>Rhodamnia rubescens</i>	+	<i>Rhodomyrtus psidioides</i>
<i>Ripogonum album</i>		<i>Ripogonum discolor</i>
<i>Sarcomelicope simplicifolia</i>		<i>Scolopia braunii</i>
<i>Smilax australis</i>		<i>Smilax glyciphylla</i>
+ <i>Sophora tomentosa</i> subsp. <i>australis</i>		<i>Stephania japonica</i> var. <i>discolor</i>
<i>Synoum glandulosum</i>		<i>Syzygium australe</i>
+ <i>Syzygium luehmannii</i>		<i>Syzygium oleosum</i>
<i>Syzygium paniculatum</i>	+	<i>Tetrastigma nitens</i>
<i>Trophis scandens</i> subsp. <i>scandens</i>		<i>Viola banksii</i>
<i>Wilkiea huegeliana</i>		

Those species marked '+' are found in littoral rainforest north of Sydney, with some restricted to the north coast or in only a few sites south of the North Coast Bioregion. The other species are geographically more widespread.



Given the small size of many stands and the history of fragmentation, the number of characteristic species in any stand is likely to be smaller than this list. In addition, the total richness of stands declines with increasing latitude and a number of the species listed above are absent or rare in the south.

4. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition and by its disturbance (including fire) history. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented but the assemblage in individual stands will depend on geographic location, size of stand, degree of exposure, history of disturbance and, if previously disturbed, stage of regeneration.

5. Threatened species and populations for which Littoral Rainforest is known or likely habitat include:

<i>Acronychia littoralis</i>	<i>Cryptocarya foetida</i>
<i>Archidendron hendersonii</i>	<i>Macadamia tetraphylla</i>
<i>Cynanchum elegans</i>	<i>Hicksbeachia pinnatifolia</i>
<i>Fontainea oraria</i>	<i>Syzygium moorei</i>
<i>Senna acclinis</i>	<i>Xylosma terrae-reginae</i>
<i>Syzygium paniculatum</i>	
<i>Amaurornis olivaceus</i>	Bush-hen
<i>Coracina lineata</i>	Barred Cuckoo-shrike
<i>Lichenostomus facioocularis</i>	Mangrove Honeyeater
<i>Monarchia leucotis</i>	White-eared Monarch
<i>Ninox strenua</i>	Powerful Owl
<i>Pandion haliaetus</i>	Osprey
<i>Ptilinopus magnificus</i>	Wompoo Fruit-dove
<i>Ptilinopus regina</i>	Rose-crowned Fruit-dove
<i>Ptilinopus superbus</i>	Superb Fruit-dove
<i>Tyto tenebricosa</i>	Sooty Owl
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Kerivoula papuensis</i>	Golden-tipped Bat
<i>Mormopterus beccarii</i>	Beccari's Freetail-bat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat
<i>Myotis adversus</i>	Large-footed Myotis
<i>Nyctimene robinsoni</i>	Eastern Tube-nosed Bat
<i>Potorous tridactylus</i>	Long-nosed Potoroo

<i>Pteropus alecto</i>	Black Flying Fox
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox
<i>Syconycteris australis</i>	Eastern Blossom Bat
<i>Thylogale stigmatica</i>	Red-legged Pademelon
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake
<i>Thersites mitchellae</i>	Mitchell's Rainforest Snail

Emu, *Dromaius novaehollandiae*, population in the NSW North Coast Bioregion and Port Stephens Local Government Area

*Menippus fugitivus* (Lea), a beetle population in the Sutherland Shire

Most of the species included in this list are found at only some sites, or vary in occurrence and abundance. As such they are not regarded as part of the characterisation of the community. Nevertheless, they are of conservation significance and need to be considered in recovery planning.

6. Littoral Rainforest occurs in numerous, small stands and in total comprises less than 1% of the total area of rainforest in NSW. The largest known stand occurs in Iluka Nature Reserve, which is approximately 136 ha. Many, but not all, stands of Littoral Rainforest have been included in mapping for State Environmental Planning Policy 26 Littoral Rainforest, but degradation of the ecological community is still occurring.

7. Weed species that threaten the integrity of particular stands include *Ambrosia artemisifolia*, *Anredera cordifolia*, *Arecastrum romanzoffianum*, *Asparagus* spp., *Cardiospermum grandiflorum*, *Chrysanthemoides monilifera*, *Coprosma repens*, *Ehrharta* spp., *Gloriosa superba*, *Ipomoea* spp; *Impatiens walleriana*, *Lantana camara*, *Macfadyena unguis-cati*, *Rivina humilis*, *Pennisetum clandestinum*, *Schefflera actinophylla*, *Senna septemtrionalis*, *Solanum mauritianum* *Thunbergia alata* and *Tradescantia fluminensis*.

8. Other threats include loss of canopy integrity arising from salt and wind damage as a result of clearing or damage to stand margins; clearing of understorey (including for firewood collection); grazing and physical disturbance of understorey including by feral deer; inappropriate collection of a range of plant species (including, but not restricted to, epiphytes); fire, particularly fire incursion along boundaries; visitor disturbance including soil compaction, soil disturbance, erosion from foot, cycle, trail bike and 4 wheel drive tracks, introduction of pathogens, and disturbance from creation of new planned and unplanned tracks; increased visitation and resulting increased demand for and use of, visitor facilities such as walking tracks, viewing platforms, toilet blocks, picnic areas etc; dumping of garden waste causing weed infestation; car and other rubbish dumping. Loss of fauna due to predation by feral animals, road kill, loss of habitat and feeding resources, disturbance from human visitation (faunal elements are essential to the ecological functioning of littoral rainforest and loss, or reduction, in pollinators and seed dispersal agents will adversely affect long term vegetation health); fragmentation resulting in loss of connectivity and possibly reduced genetic exchange between populations. For stands not protected by State Environmental Planning Policy 26, clearing and development remains a possibility. (Adam 1987, 1992; Floyd 1990; Mills 1996).

9. In view of the above the Scientific Committee is of the opinion that Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become

extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam  
Chairperson  
Scientific Committee

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**References:**

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## APPENDIX 7: Checklist For Bush Regeneration Activities In The Habitat Of Threatened Species, Endangered Populations And Endangered Ecological Communities

### Background

Threatened species, endangered populations and endangered ecological communities are protected in NSW under the *Threatened Species Conservation Act* 1995 (TSC Act).

It is an offence to “harm” or “pick” threatened species, populations or ecological communities, or cause “damage” to critical habitat or the habitat of threatened species, populations or ecological communities<sup>1</sup>.

“Harm” refers to native fauna, and is defined as to: hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure, or kill.  
“Pick” refers to native flora, and is defined as to: gather, pluck, cut, pull up, destroy, poison, take, dig up, remove or injure the plant or any part of the plant.  
“Damage” is not defined but the common dictionary definition would apply.

It is a defence to a prosecution if the action was:

- authorised in accordance with a Section 120 licence or a Section 132C licence under the *National Parks and Wildlife Act* or a licence granted under Section 91 of the TSC Act (flora and ecological communities);
- authorised in accordance with a development consent under the *Environmental Planning & Assessment Act 1979*; or
- authorised by or under the Rural Fires Act 1997, or the State Emergency and Rescue Management Act 1989.

- a species (flora or fauna) is not known to exist on the site (e.g. cryptic species such as orchids);
- a species may be accidentally harmed or picked (e.g. by spray drift or accidental cutting).
- a species may be misidentified and is thought to be either an exotic or common native species and therefore may be removed or damaged;
- the requirements of the species, including habitat structure and components, may be temporarily adversely impacted (e.g. maintaining microclimatic conditions, connecting or sheltering habitat for fauna);

### Licensing

Those undertaking bush regeneration activities may consider applying for a Section 132C licence under the NPW Act.

A Section 132C licence is issued where the NPWS considers that the proposed work is for conservation purposes.

### License Conditions

Generally, licences are issued on an annual basis; however, shorter or longer term licences are also issued where appropriate.

The NPWS may prohibit, condition, or limit bush regeneration works in some areas where it may affect research plots. Other licence conditions may be applied after consideration of population estimates, age structure, viability and health of the population or individuals.

### Bush regeneration activities

Areas where bush regeneration is undertaken are often the habitat of threatened species or may be an endangered ecological community (e.g. Lowland Rainforest on Floodplain). It is understood that the intention of bush regeneration activities is to have a positive impact, however, there is a chance that these activities may adversely impact on threatened species, populations or ecological communities. This may occur where:

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## The Bush Regeneration Checklist

The intention of the checklist is to ensure that bush regeneration activities will **not** have a significant impact on threatened species, populations or ecological communities and their habitats. Applicants should consider attaching this standard checklist to any Section 132C licence application to assist the NPWS in assessing the significance of the proposed activity. The NPWS will assume the applicant is prepared to adhere to the guidelines in the checklist where they form part of the licence application. Detail of any proposed work additional or contrary to that described in the checklist must be provided. The NPWS then assesses the likely significance of the impact of the proposal<sup>2</sup> using the information provided in the licence application.

For the purposes of the checklist, bush regeneration is considered as all types of habitat restoration and may include such activities as manual weed removal, herbicide use, temporary damage to, or removal of

native plants, planting, track work or maintenance and habitat removal or modification.

Threatened Species are listed under two schedules on the Threatened Species Conservation Act: Schedule 1 includes Endangered Species, Endangered Populations and Endangered Ecological Communities and Schedule 2 includes Vulnerable species. The Threatened Species Conservation Act Schedules are maintained by the NSW Scientific Committee. The most recent versions of these schedules may be obtained on the NPWS Web Site: [www.nationalparks.nsw.gov.au](http://www.nationalparks.nsw.gov.au).

A Species Impact Statement must be prepared where a proposed activity is assessed as likely to have a significant impact on threatened species, populations or ecological communities.

The Wildlife Atlas is the NPWS statewide flora and fauna database.

## NPWS Checklist For Bush Regeneration Activities:

**Please Note:**

- 1) The checklist is provided to facilitate licence applications and to draw attention to NPWS issues of concern.
- 2) There is no requirement to use the checklist when applying for a licence. You may alternatively choose to provide details of your project and an explanation of how you will ensure there will not be a significant impact on threatened species, their habitat or on endangered ecological communities.
- 3) If you provide a negative answer using the checklist this does not necessarily mean your application will be unsuccessful. You will however need to provide a satisfactory explanation as to why you do not wish to comply with the guideline and how you will ensure there is unlikely to be a significant impact on threatened species, their habitat or on endangered ecological communities.
- 4) You may wish your licence application to cover the collection of Voucher Herbarium Specimens and Plant Material for Identification. Guidelines to cover those activities are also attached.

Management Planning:	yes	no	more info attached
The proposed activities will be in accordance with a management plan or site plan (map). <i>Please attach the plan or relevant sections of the plan or strategy to the licence application.</i>	√		
The project has been discussed with the relevant Landcare coordinator. <i>If not, provide details of any other professional advice you have sought, e.g. from a qualified bush regenerator.</i>	√		
A NPWS Wildlife Atlas database search of a 5km radius of the site has been undertaken to identify threatened flora/fauna species known or likely to occur on the site. <i>The Wildlife Atlas is accessible on the NPWS Web Site <a href="http://www.nationalparks.nsw.gov.au">www.nationalparks.nsw.gov.au</a>.</i>	√		
Prior to commencing any works on site, a permit or permission will be obtained from the relevant landowner(s) or land manager(s).	√		
<b>Training and supervision:</b>			
All workers carrying out bush regeneration and associated works will be supervised by a trained and experienced co-ordinator who has completed a recognised bush regeneration course (e.g. the Certificate of Bushland Regeneration) or a minimum of 2 years bush regeneration experience. <i>If 'yes', please provide below the name and qualifications of the co-ordinator.</i> Name: ..... Qualifications/experience: .....	√		
Other members of the group that have bush regeneration training or experience. Name: ..... Qualifications/experience: ..... Name: ..... Qualifications/experience: ..... Name: ..... Qualifications/experience: ..... Name: ..... Qualifications/experience: ..... Name: ..... Qualifications/experience: .....			
All activities by workers will be regularly checked and approved by the co-ordinator.	√		
All workers will be informed of any threatened species or endangered ecological communities in the area or which may occur in the area and the potential impacts of activities on these species/communities. <i>e.g. vines on the edge of a littoral rainforest remnant may protect the remnant from salt-bearing winds.</i>	√		
	<b>yes</b>	<b>no</b>	<b>more info attached</b>

## Seven Mile Beach (Precinct 2) Beachfront Management Plan

All workers have adequate weed and native plant identification skills. <i>i.e. all workers can identify and differentiate between weeds and native plants that occur on the site.</i>	√		
Workers will be familiar with the identifying features of threatened flora that are known or likely to occur in the project area. Where threatened species known from the area are similar to weed species, the distinguishing features between these will be understood prior to commencing the work.	√		
<b>Access to sites</b>			
All vehicular access to sites will be restricted to formed roads.	√		
Unnecessary damage to sites will be avoided. <i>e.g. avoid working in wet weather to lessen soil compaction.</i>	√		
<b>Impacts on flora:</b>			
Prior to any works being undertaken, the presence or absence of threatened flora will be determined by a thorough walking search of the area.	√		
All threatened flora will be tagged with highly visible flagging tape before work commences. If a number of individuals occur in a clump, that area should be marked out with flagging tape.	√		
Cutting or damaging of threatened flora will be avoided.	√		
All plants will be positively identified before they are removed (pulled, cut, poisoned etc).	√		
Weed removal within 2m of a threatened species will be undertaken by hand.	√		
To reduce the possibility of introducing plant diseases and weeds the following measures will be applied: 1. Secateurs will be sharp and cleaned with methylated spirits. 2. Footwear will be cleaned of loose soil and preferably treated with bleach between sites.	√		
<b>Impacts on fauna:</b>			
All workers will be aware of any threatened fauna that are known or likely to occur on site, and the potential impacts of the proposed activities on those species.	√		

Seven Mile Beach (Precinct 2) Beachfront Management Plan

The habitat and refuge potential of weeds and rubbish will be considered prior to removal. <i>e.g. Lantana can provide cover for threatened fauna such as the Bush-hen. Dead Lantana and poisoned Camphor Laurels should, where possible, be left in situ.</i>	√		
Weeds will be removed gradually in areas where an infestation is extensive. <i>Ideally, 50% of weeds that may provide habitat should be left until native plant species have re-established and provide alternative refuge.</i>	√		
Disturbance to, and removal of rocks, logs and other potential refuge sites will be avoided.	√		
A herbicide registered for use near waterways will be used within 5m of waterways.	√		
Herbicide spraying will be prohibited within 5 metres from watercourses where threatened frogs are known or likely to occur and within a 10m radius of records of threatened frogs.	√		
A buffer of 1m along other watercourses will be maintained in which no herbicide will be sprayed.	√		
Care will be taken to minimise disturbance to shy or cryptic species. <i>e.g. the Marbled Frogmouth roosts in vine 'curtains'.</i>	√		
Care will be taken to minimise disturbance to the leaf litter layer.	√		
<b>Reconstruction through revegetation:</b> <i>This section does <b>not</b> address propagation or planting of threatened species – this activity would need to be separately addressed.</i>			
Seed collection or cuttings will be from species, populations or ecological communities other than those listed as threatened (unless licensed by NPWS).	√		
Prior to collecting any seed or cuttings permission will be obtained from the relevant landholder or manager of the site. <i>e.g. a licence is required to collect native plants on National Parks estate.</i>	√		
Seed collection from any one species will be limited to less than 10% of the available crop at that site.	√		
Seed collection from any individual plant will be limited to less than 10% of the available crop.	√		
If your seed source is used by other seed collectors, has consideration been given to minimising any cumulative impacts to the source plants? <i>Some individual plants are known as a reliable seed source and their seed is collected extensively. This may result in – (i) a reduction in genetic diversity; (ii) an impediment to the individual's natural ability to regenerate.</i>	√		
When collecting propagation material from a wild population, collection will be random from as many individuals as possible across the population to ensure a representative range of genetic material is collected. Collectors will avoid selection of propagation material on the basis of physical attributes. <i>e.g. tallest, most attractive, greatest amount of seed or flowers.</i>	√		
Plantings will be sourced from stock of local provenance.*	√		
	<b>yes</b>	<b>no</b>	<b>more info attached</b>
Propagated plants will be used only at the subject site. <i>i.e. excess material will only be used at other sites if it meets the provenance criteria.</i>	√		
A buffer of 5 metres will be maintained around all threatened plant specimens. Planting will only be undertaken outside this buffer. <i>This requirement is intended to protect the roots of the threatened plant from damage, introduction of disease or impacts of herbicide.</i>	√		
Care will be taken to ensure that mulch does not introduce weeds or impede natural regeneration at the site.	√		
Care will be taken to ensure that weeds and/or phytophthora are not introduced to a site from any plantings.	√		



## Seven Mile Beach (Precinct 2) Beachfront Management Plan

Consideration will be given to the possible impacts of plantings on the ecological requirements of threatened species at the site <i>e.g. reduced light, competition, etc.</i>	√		
Species will be planted within their natural habitat and range. Plantings will be guided by the plants' local habitat preferences. <i>e.g. the species used for plantings along watercourses should be those that naturally occur in that habitat in your local area.</i>	√		
<b>Herbicide use:</b> A permit from the National Registration Authority for Agricultural and Veterinary Chemicals PO Box E240, Kingston ACT 2604 may be required for herbicide use that is not consistent with conditions specified on the label.	Yes	No	
A buffer of 2m will be maintained around all threatened plant specimens. Herbicide use will only be undertaken outside this buffer.	√		
Herbicide use will cease where there are any signs of threatened species being affected by herbicide. <i>e.g. browning off, wilting, deformed growth.</i>	√		
All herbicide spray operators will be capable of undertaking precise and effective weed control.	√		
Spray will be directed away from threatened flora.	√		
Herbicide will only be sprayed in suitable weather conditions when the impact of spray drift (windy) or run-off (wet) on threatened flora is minimised.	√		
Marker dyes <i>e.g. 'white field marker'</i> will be mixed with herbicide before use. <i>Marker dye enables the worker to see where the spray is landing.</i>	√		
<b>Reporting and data records:</b>			
Any new records of threatened species will be provided within three months to NPWS. These records will be in a format appropriate for entry into the Wildlife Atlas, once identification of a threatened species is confirmed by a recognised authority. <i>Wildlife Atlas cards available on request.</i>	√		

\*Local provenance species should be regarded as those species propagated from material that has been collected from a natural wild population as close as possible to a site. For example, within the local catchment – which may be based on a local creek.

Please sign below, keep a copy for your records and attach all original pages of checklist, and any additional information, to your application form.

I, the undersigned, agree that the proposed bush regeneration activities are in accordance with all items checked above, additional information attached and the licence application form.

\_\_\_\_\_  
Name (please print)                      Signature                      Date

Further reading:

Buchanan, R. (1989) *Bush Regeneration: Recovering Australian Landscapes*. TAFE Student Learning publication, Sydney.

Buchanan, R. (1992) "Site assessment – a vital part of bush regeneration" in *Urban Bushland in Western Sydney*. Seminar Proceedings, Nature Conservation Council of NSW, 1992.

FloraBank (1999) *Guidelines 5: Seed collection from woody plants for local revegetation*. FloraBank, ACT.

FloraBank (1999) *Guidelines 6: Native seed collection methods*. FloraBank, ACT.

FloraBank (2000) *Guideline 10: Seed Collection ranges for revegetation*. FloraBank, ACT

Greening Australia NSW (1999) *Management principles to guide the restoration and rehabilitation of indigenous vegetation*. Greening Australia NSW, Sydney.

Harden, G. (1990-1993; 2002) *Flora of NSW*, Vols 1-4. University of NSW Press, Kensington.

Joseph, R. (1999) An integrated, systematic approach to rainforest remnant restoration. In *Rainforest Remnants – A Decade of Growth*. Proceedings of a conference on rainforest regeneration., NSW National Parks and Wildlife Service, Alstonville.

McDonald, T. (1993) Strategic plans for bush regeneration. in *Bushland in Our Cities and Suburbs Part 1: Making Planning Work*. Seminar Proceedings, Nature Conservation Council of NSW, 1993.

McDonald, T. (1994) What are we doing with ecosystem resilience and the restoration of damaged plant communities. in *Bushland in Our Cities and Suburbs Part 2: Making Bush Regeneration Work*. Seminar Proceedings, Nature Conservation Council of NSW, 1994.

NSW National Parks and Wildlife Service. (2000) *Threatened species of the lower north coast of NSW*. NSW NPWS, Coffs Harbour

NSW National Parks and Wildlife Service. (2002) *Threatened species of the upper north coast of NSW*. Vol 1. Fauna. Vol 2. Flora. NSW NPWS, Coffs Harbour

NSW National Parks and Wildlife Service. (2003) *Threatened species of the New England Tablelands and North West Slopes of NSW*. NSW NPWS, Coffs Harbour

## Acknowledgements

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## **APPENDIX 8: Tools and Equipment Required**

### **Non-consumables**

- Plastic or steel boxes for equipment storage
- Leather pouches with belts to secure secateurs and knives
- Felco® secateurs (no.5)
- Victorinox® boning knives with non-slip handles
- Sandvik® loppers (no.16)
- Large bow saw
- Small pruning saws
- Poison pots, stands, and paintbrushes
- Goggles for mixing and applying herbicide
- Tomahawk
- Tree injection unit
- Sharpening stone
- Post hole shovels for tree planting
- Hoses
- Wheel barrow
- Chemical measuring container
- Rubber gloves for measuring and applying herbicide
- Gardening gloves
- 15 litre backpack spray unit with Rega® nozzle
- Fertilizer (or other large) sacks for weed and tuber removal
- Black builders' plastic for composting
- Native plant and weed identification manuals
- Hand lens
- Camera
- First aid kit
- Tarp for laying tools out on when the ground is wet (various other uses i.e. erecting sunshade, rain protection etc.)

### **Consumables**

- Aerosol oil for tool maintenance (WD40® or Inox®)
- Tree fertilizer tablets (Agriform®)
- Diary/ journal
- Work record sheets (see Appendix 7)
- Flagging tape
- Photographic film
- Glyphosate (Roundup®)
- Protec® - acidifier
- Metsulfuron (Brushoff® or Brush Killer®)
- Agral® – surfactant
- Spray marker dye
- Fencing material – timber posts, pig wire, shade cloth
- Trees for planting
- Nitram® – fertiliser
- Water crystals or wetting agent
- Tree guards and/or wallaby repellent spray
- Stakes or star pickets for photo points

## APPENDIX 9: Regeneration Record Sheet

### REGENERATION RECORD SHEET

Remnant Name:	Date:
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Personnel/Volunteers:	Hours Worked:
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Weather Conditions (temperature, prevailing wind, cloud cover etc.):
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Work Completed (work zone – use map on reverse, methods trialled, comments on previous works, monitoring, follow-up or reminders etc.):
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Weeds Treated	Methods Used	Chemical & Application Rate

Chemical	Vol. Used (ml)	Chemical	Vol. Used (ml)

Payment/Funding	Cheque No.	Invoice No.

Observations (flora, fauna, fruiting, flowering etc.):
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Accidents/Incidents/Near Misses:
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## APPENDIX 10: Detail on Stayturf® reinforced turf product

From: [www.jimboombaturf.com.au](http://www.jimboombaturf.com.au)



[Sea Isle](#) will be the [most environmentally friendly warm-season turfgrass](#) in the 21st century. This grass can tolerate a wide range of water resources, including [potable water](#) and [seawater](#) as well as variable quality recycled (alternative, grey, effluent, non-potable, [wastewater](#), brackish) water.

★★★★	Disease resistance
★★★★	Wearability
★★★★	Frost Resistance
★★	Shade Tolerance



The grass requires only minimal pesticides and judicious applications of fertilisers. It is very efficient in the uptake and utilisation of critical fertiliser nutrients. Thus, [Sea Isle](#) can be easily managed to comply with local, state, federal, and global regulations dealing with environmental concerns on water quality/quantity and environmental stewardship issues.

[Sea Isle](#) has multiple uses in the turf industry. It has the leaf texture, quality, and traffic tolerance for use on golf course greens, tees, fairways, and roughs; on [sports fields](#) including football, baseball, and soccer; in [home lawn](#) and business landscape areas; in municipal parks, and; on roadsides, especially low [drainage ways](#). It can be used to clean up [polluted or contaminated waters](#) or soils (bioremediation). It can be effectively used to transition into wetland sites or other [environmentally sensitive areas](#) to minimise the potential for point and non-point source pollution or contamination from industrial sites or other problem areas.



For all information visit our [Sealsle1 & Sealsle2000 section](#)

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