WALLABI POINT LITTORAL RAINFOREST

& POST FIRE REHABILITATION

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CONTENTS

Front Cover

Main Photo: Post fire littoral rainforest seaward buffer with dead Coastal Tea Tree and Coastal Banksia being invaded by Bitou Bush. Wallabi Coastcare volunteers doing their thing.

Photo Strip: From top to bottom – First Rock Gully – Sunlight on littoral rainforest floor – Seeds of Guioa semiglauca – Fallen tree disturbance in the forest

We acknowledge the Traditional Owners of the land on which the Wallabi Point littoral rainforest occurs, the Biripi People, and pay our respect to Elders past, present and emerging. We acknowledge the deep spiritual, cultural and customary connections of Traditional Owners to Country of land and sea

INTRODUCTION

The littoral rainforest of Wallabi Point has been ignored for many years, what has laid hidden is 3.5 hectares of littoral rainforest extending from the North Wallabi beach access track northwards to the sewage treatment plant boundary.

The bushfire which encircled Wallabi Point of the 9th of November 2019 burnt the entirety of the rainforest with varying degrees of intensity, hotter in the northern end near the sewage exfiltration ponds and cooler in the southern end adjoining the township. It is estimated that the extent of the littoral rainforest has been reduced from a pre fire area of 3.5 hectares to a post fire 2.5 hectares.

The objective of this report is to document Wallabi Point's very own rainforest, its recovery from the fire, and ensure it is legally protected from development and exploitation.

The report has been written in a style designed to be accessible to everyone while maintaining the science and practices of natural resource management. It is hoped that this report will be passed down through the generations of Wallabi Point Coastcare volunteers so that their appreciation and knowledge of this significant natural asset will continue to expand, and the forest will be appreciated for what it is, a rare and natural wonder.

Importantly, should the day come again that the rainforest is damaged by fire, then this report will provide a basis from which rehabilitation can commence.

A summary of the conservation status of littoral rainforest is included in this report. If your interest is the rainforest and you find that all the government legislation, and legal mumbo-jumbo does your head in, then just skip over those bits - besides, as our governments evolve over time and each successive government desires to rewrite the legislation in its own image and to its political bent, we can expect the legislation to change roughly every 10 to 20 years.

A bibliography is provided at the end of the report to recognise the body of knowledge contained within this text - noting that the bibliography references are not cited in the text. For those of you interested in learning more about the littoral rainforest ecological community, the vegetation of the rainforest, and ecological restoration then the cited texts are an excellent starting point.

Note that throughout the text native species will be identified by their common name with their botanical name in parenthesis ( ) while, unless felt necessary, weeds are identified by their common name only, which can be cross referenced to their botanical name in Attachment C: *'Wallabi Point Littoral Rainforest Weed Species List'*.

A Coastcare group first operated at Wallabi Point from 2005 to 2012, the group was initiated by Jeff Miller. The group worked the area from the North Wallabi beach access track to the sewage pumping station at the end of Marine Drive. David Brunner-Evans revived the group in 2018 With works conducted from Tarrant's Beach, on the southside of the point, northwards to around 200 metres north of the beach access track at North Wallabi. Works in the northern section of littoral rainforest did not commence until after the 2019 fire.

The preparation of this report has been possible because of the knowledge and wisdom of many people who have given their time and knowledge freely.

BACKROUND

Local Context: Prior to European settlement littoral rainforest may well have extended from Saltwater to Manning Point, if not as one continuous strip, then as closely associated standalone communities. It is also likely that a larger strip of littoral rainforest, compared to modern day area, existed between Wallabi Point and Old Bar, perhaps as much as 15 to 20 hectares in area, but it was severed by the construction of the sewage plant's exfiltration ponds, residential development at Old Bar and illegal clearing on private land.

No rutile mining occurred between Wallabi Point and Old Bar.

Disturbance in the form of sand extraction is known to have occurred at First Rock Gully where sand was extracted by Billy Wright for use in construction. At the north end of Marine Drive, near the sewage pumping station, the area was used as a dumping ground for waste from local building and road construction and remnant debris can still be found lodged in the soil.

For a period, before the construction of Saltwater Road, a road extended from the end of Lewis Street, Old Bar to Wallabi Point and the remains of a timber bridge can be seen in First Rock Gully. The bridge was reportedly not of sufficient engineering standard to support the school bus and the students had to walk across the bridge to catch the bus. The degree of historical damage to the littoral rainforest is unknown as there appears to be no historical records of the road's location nor, apart from the remains of the bridge, is there any evidence of the road's location.

Aboriginal Heritage: The Biripi people are the traditional custodians of the land on the Mid North Coast. The shark is the major sea totem of all Biripi people from Point Plomer in

the north, to Port Stephens in the south. The shark and sea turtle landscape carvings in bushland to the west of the rainforest site represent the totems for the area.

Image Above: Aboriginal Heritage - Biripi sea turtle and shark totem carvings. January 2016

The local littoral rainforest provided the Biripi people alternative food and medicine sources compared to surrounding eucalypt dominated forest. The plump fruits and seeds of plants such as Figs, Lilly Pillies, Plum Pine, Black Apple and Native Raspberries were not only a good food source, but they also attracted birds and animals that were also highly prized food.

Aboriginal Heritage Information Management System (AHIMS), a register of Aboriginal sites and places in NSW, indicates there are six recorded Aboriginal artefact sites within one kilometre of the northern end of Marine Parade. Of the six recorded sites four may fall within the littoral rainforest footprint.

Rainforest - what we know: Finding information about the Wallabi Point's littoral rainforest is not easy. Two people with an interest in the local ecosystems and natural resource management are Peter Gollan and Jeff Miller:

Peter Gollan now manages the MidCoast Council nurseries and is the principle of the Dingo Creek Rainforest Nursery in the Manning Valley, but in the mid 1980's Peter reported to the Greater Taree City Council on the condition of littoral rainforest in the local government area. Peter says that in general all littoral rainforests were in a poor condition due to sand mining, development, fire, and a lack of focus on protecting the ecosystems.

Peter recalls that the area north of the Wallabi Point township, and now identified as littoral rainforest, "was not on the radar" and that it was poor quality with not much canopy. It should be noted that that was a common description for littoral rainforest along the council beaches at that time.

Peter also notes that fire was a common occurrence along beaches with spot fires occurring through arson, juvenile fire setting or pyromania.

Jeff Miller was a resident of Wallabi Point when around 2005 he started the area's first volunteer Coastcare group. The group was active for seven years until Jeff's employment limited the amount of effort, and time he could devote to managing the areas natural resources.

The area Jeff's group worked on extended from the beach front at North Wallabi beach to the end of Marine Drive and the sewage pumping station. The groups major achievement was tackling the ground asparagus which was knee deep under the rainforest canopy.

At that time bitou bush was present but not a major problem while mother of millions was a problem along the beach access track and immediately behind the beach.

The group had access to plants for regeneration planting and strategically used Lomandra along Marine Drive to try to prevent weed incursion and improve roadside aesthetics.

Bushfire: The NSW Government provides historical fire data through its Sharing and Enabling Environmental Data (SEED) portal, the fire data is derived from Rural Fire Service (RFS) records. Available SEED information for the Old Bar and Wallabi Point area dates from the 1960's. Note: The older the data the less reliable it is.

Commencing in 1960 there have been four recorded fires in the vicinity of the Wallabi Point littoral rainforest (See Figure 1):

***1965/66**:* An area of approximately 40 hectares from just south of the end of Lewis Street at Old Bar through to and including the Old Bar littoral rainforest just south of Old Bar Primary School. The recorded burnt area was approximately 1.4 kilometres north of the Wallabi Point rainforest.

1971/72: An area of approximately 55 hectares on the east side of Saltwater Road through to what is now the Blue Haven Estate and the Trad playing fields, and from the sewage treatment plant in the south to the pony club in the north. The recorded burnt area was approximately 750 metres west of the Wallabi Point rainforest.

1977/78: An area of approximately 6 hectares from the end of what is now Walter Fay Street, Wallabi Point, and the Turtle Camp site eastwards to the edge of the shark totem carving. The recorded burnt area was approximately 200 metres west of the Wallabi Point rainforest.

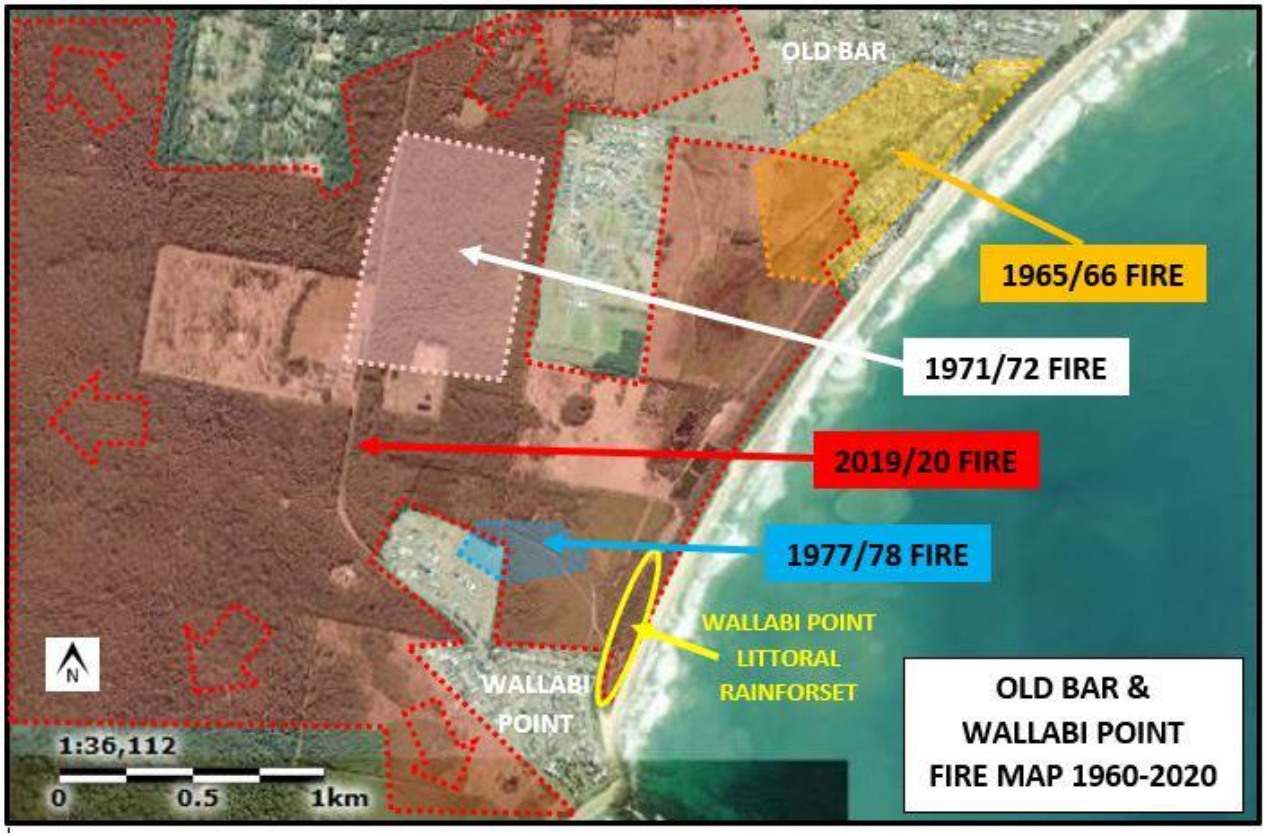
2019/20: The Hillville fire burned an area of over 31,000 hectares from Hillville in the west, to Possum Brush and Rainbow Flat in the south and to South Taree and Glenthorne in the north, including all vegetation south, west, and north of Wallabi Point. The Wallabi Point littoral rainforest was burnt through on the 9th of November 2019.

It is noteworthy that in a few areas within the rainforest that groups of trees grow from a coppicing crown which can be a common feature of some tree species after fire. Generally, these coppiced trees occur adjacent to each other and as a cohort of around the same age and size and may be an indication of previous spot fire events not recorded within the SEED portal (See Peter Gollan's previous fire comments on page 2).

Littoral Rainforest - Manning Valley Landscape: Significant examples of littoral rainforest on the Mid North Coast can be found on sand dunes at Harrington to Crowdy Head, Old Bar Beach, Saltwater and Diamond Beach as well as on headlands at Red Head and Black Head. At Kylie's Campground on the south side of Diamond Head in Crowdy Bay National Park the littoral rainforest was also burnt in November 2019, and it bears some geomorphic similarities to Wallabi Point and is a suitable reference site for fire impact and recovery.

Note: The MidCoast2Tops Landcare website provides comprehensive information about the littoral rainforest of the Mid North Coast of NSW.

Figure 1: Fire history 1960 to 2020, Wallabi Point to Old Bar



PART 1 - LITTORAL RAINFOREST

LITTORAL RAINFOREST

Description

Littoral rainforest is a closed forest with greater than 70% canopy cover, the forest structure and flora composition are strongly influenced by proximity to the ocean. The plant species of this community are predominantly rainforest mesophyll species and is primarily composed of trees and vines. The vines may become dominant in the canopy. Although the canopy may be dominated by rainforest species, scattered individuals of sclerophyll species, such as Coastal Banksia (*Banksia integrifolia)* and localised *Eucalyptus, Melaleuca* and *Acacia* species may occur. Littoral rainforest is very rare and occurs in many small stands. There is considerable floristic variation between stands.

MESOPHYLL & SCELROPHYLL

***MESOPHYLL* PLANT SPECIES GENERALLY HAVE A HIGH WATER CONTENT IN THEIR SOFT LEAVES THAT MAKES THEM MORE RESISTANT TO FIRE**

***SCLEROPHYLL* PLANT SPECIES HAVE HARDER AND DRIER LEAVES THAT MAKES THEM MORE SUSCEPTABLE TO FIRE. IN AUSTRALIA SCLEROPHYLL SPECIES SUCH AS EUCALYPTUS AND MELALEUCAS ALSO HAVE A HIGH VOLITILE OIL CONTENT THAT MAKES THEM BURN EASILY AND RAPIDLY**

Littoral rainforest requires rainfall of greater than 1250mm per annum, elevation at sea level to 30 metres, impacted by onshore winds and salt spray and may occur on either deep sands (sand dunes) or soils derived from weathered igneous rock substrate (headlands).

The structure of littoral rainforest is dependent on its location and exposure to oceanic weather. There are two structural types of littoral rainforest which occur on different soil types although they share many of the same plant species.

The core littoral rainforest with 70% or greater canopy cover is a mixture of tree and vine species, the midstory is thin and ground cover is limited. The structural edges of the rainforest, also called the buffer zones as they protect the core forest from disturbance, are dependent on seaward and landward weather exposure. The seaward exposure results in plant species adapted to salt and wind with the exposed plants being wind sheared. The landward exposure is less impacted by wind and salt and becomes a more open woodland structure with less dense tree canopy and an increase in midstory shrub and ground cover. Loss of structural edges and canopy of the forest can result in light being let into the understory which will promote weed growth and allow salt-laden wind to intrude and impact the undergrowth and regrowth in the area.

Being a closed canopy forest littoral rainforest produces its own microclimate, one which is cool and moist. Low light levels under the canopy and the moister microclimate mean that only those species adapted to the conditions can survive. The canopy itself is subject to a full range of light conditions, fluctuating humidity and temperatures and buffering by wind and storms, but under the canopy the microclimate produces more stable conditions.

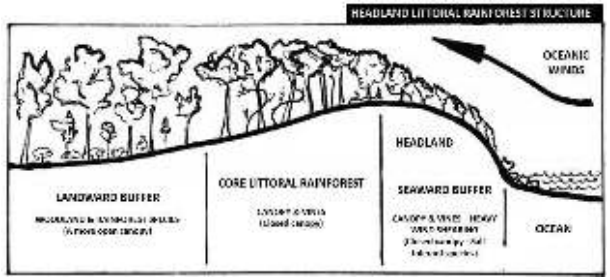
The two structural types of littoral rainforest are:

- Headland littoral rainforest
- Sand dune littoral rainforest.

Headland Littoral Rainforest

Headland littoral rainforest: (Figure 2) the seaward edge is directly exposed to strong, salt laden, oceanic winds. Only the hardiest and best adapted plant species survive in the harsh conditions. Typical plant species on the seaward edge include Tuckeroo (*Cupaniopsis anacardioides*), Beach Bird's Eye (*Alectryon coriaceus*), Lilly Pilly (*Syzygium smithii*), She Oak (*Casuarina glauca*), Coastal Wattle (*Acacia longifolia* subsp. *sophorae)* and Figs (*Ficus spp.*). Immediately behind the seaward edge, plants are protected and grow taller while species diversity increases. On the landward edge, as the rainforest canopy begins to thin, the sclerophyll species such as *Eucalyptus, Acacia* and *Melaleuca* become increasingly dominant and grass and midstory plants become increasingly numerous. Transformer weeds such as lantana and bitou bush are more likely in the buffer zones while ground asparagus is more likely under the rainforest canopy.

Figure 2: Headland Littoral Rainforest Structure

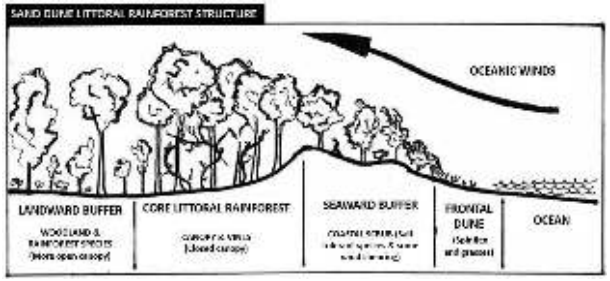


Sand Dune Littoral Rainforest

Sand dune littoral rainforest: (Figure 3) the seaward edge transitions from the beach with pioneering grass species such as Coastal Spinifex (*Spinifex sericeus)* intergrading with Coastal Wattle *(Acacia longifolia* subsp. *sophorae)* into foredune scrub comprised of Coastal Wattle, Coastal Banksia (*Banksia integrifolia*), Coastal Tea Tree (*Leptospermum laevigatum*), while Tuckeroo (*Cupaniopsis anacardioides*) and Beach Bird's Eye (*Alectryon coriaceus*) are more common at the edge of the core littoral rainforest. Wind-shearing is less of

an impact because of the lesser foredune face gradient and plant species adapted to the conditions on dune faces. Immediately behind the edge, the plants become protected and grow taller while species diversity increases. On the landward edge the canopy thins out and sclerophyll species such as *Eucalyptus, Acacia* and *Melaleuca* become more dominant among the rainforest species while grass and midstory plants become more numerous.

Figure 3: Sand Dune Littoral Rainforest Structure



Depressions in the dune swales may also intersect with the water table and freshwater wetlands may occur. Transformer weeds such as Lantana and Bitou Bush are more likely in the buffer zones while Ground Asparagus is more likely under the rainforest canopy.

Rainforest Microclimate

A microclimate is a place that has a local set of atmospheric conditions that differ from those in the surrounding area. The closed canopy of the rainforest alters the climate under the canopy and creates a microclimate that is:

Cooler - than the external temperature
Darker - as less light reaches the forest floor
Moister - as trapped humidity
Calmer - as air movement is less compared to the external winds

These atmospheric changes in the rainforest create conditions that are less flammable than surrounding ecosystems and can act to supress fire by reducing the fire intensity, preventing fire spread and reducing disturbance.

Disturbance

Rainforests can tolerate some forms of natural disturbance depending upon the size of the disturbance. Minor disturbance, such as individual tree death or damage from storms and wind, may create gaps in the canopy by permitting light to enter the forest and trigger a renewal process starting with pioneering species. Large disturbance events such as storms, weed infestations and fire, may have a negative impact on the rainforest ecosystem by changing its structure and function. In the case of fire just one fire can substantially reduce the size of the forest and repeated and frequent fire events can be an existential threat of destroying the rainforest ecosystem.

The recovery process of such disturbance initiates a complex process of rainforest succession and regrowth and is known a 'gap phase dynamics', where plant species compete for the newly created space, light, and warmth on the forest floor.

Long term disturbance has resulted in much of the littoral rainforest that existed at the time of European settlement being cleared or converted to other land uses, while urban development and sand mining have considerably reduced the extent of distribution. Littoral rainforest can still maintain the features of a functioning ecosystem even after some disturbance, although it may experience a potential loss of biodiversity and structure. Today littoral rainforest comprises less than one percent of the total area of rainforest in NSW due to such long-term disturbance.

These remnant populations of littoral rainforest occur as a series of irregular and detached stands. Although it is disturbed and highly fragmented, it is also a relatively resilient ecological community and may recover well from such disturbance, although recovery will take decades rather than years.

Resilience

Rainforest ecosystem's ability to cope with disturbance is called resilience (see info box). It is the ecosystems response to various types and degrees of disturbance that control the rate at which the ecosystem will recover, or in cases of major disturbance, how much it will recover or not recover. The frequency with which disturbance events occur will dictate the resources the ecosystem has available to regenerate. For example: a depleted seed bank, or plant species reproductive cycles disrupted resulting in no seed production.

RESILIENCE

RESILIENCE IS THE INHERENT ABILITY OF AN ECOSYSTEM TO ABSORB DISTURBANCES AND REGENERATE WHILE UNDERGOING CHANGE AND MAINTAINING ECOSYSTEM FUNCTIONS.

Connectivity

Development, and landscape scale disturbance, has resulted in littoral rainforest being reduced to remnant stands of various sizes, complexity, structure, and spread parallel to the coast. These islands of vegetation form steppingstones along which wildlife, including birds, flying foxes and insects, can transfer pollen, seeds and genes from one stand to another. Where possible the opportunity should be taken to provide corridors of rainforest vegetation to link the

islands and to create freer movement for wildlife between these stands.

Natural Regeneration

Natural regeneration is the process by which rainforest repairs itself through natural processes. Following disturbance, regrowth may occur through seed that is present on site (in situ) or self-recruited from off site (ex situ) or through vegetative means through resprouting via suckering, coppicing or epicormic growth.

Succession

The process of natural regeneration requires successional development of the vegetation diversity and forest structure. Succession generally occurs in an orderly process of ecosystem development that is directional over space and time, and predictable such as increased biodiversity and forest structure.

Succession occurs in three stages through changes in vegetation and forest structure:

Pioneer: In the pioneer stage the forest structure is dominated by pioneer species which are fast growing, light dependent, short lived, tend to be short and fruit heavily and annually.

Secondary: In the secondary stage the forest structure is dominated by secondary species which are slower growing, not as light dependent, longer lived, taller and slower to fruit. Technically the secondary stage is subdivided into 'early' and 'late' stages, but this is not as applicable in littoral rainforest and for the purpose of this report we will treat all under the one stage of 'secondary'.

Mature: In the mature stage the forest structure is dominated by mature species which are slow growing, able to germinate in shade, long lived, variable shape and size, with some species becoming emergent above the forest canopy, and slow to fruit.

The succession time path is measured in decades not years. The pioneer stage with short lived plants will, over five to fifteen years, give way to the secondary stage which over the next two to three decades will slowly transition into the mature stage. Major disturbance can set the succession pathway back to the pioneer stage with just one event.

Pollination

Rainforest plants have several different methods for pollen dispersal, such as pollination by animals including flying foxes, birds, and insects, like native bees, butterflies, and beetles. Wind is also used by some species such as Plum Pine (*Podocarpus elatus)* and She Oak *(Casuarina glauca*).

Seed Dispersal and Seed Bank

The majority of littoral rainforest canopy and midstory plants rely upon animals to disperse seed by ensuring the seeds are enclosed within fleshy pulp. The animals either discard seed when eating the fruit or pass the seed through their gut. Birds and flying foxes are effective seed dispersers over long distance as they move from one stand of forest to another. A notable exception is Coastal Banksia (B*anksia integrifolia*) which relies upon gravity and wind and, despite a common misconception, is one Banksia species not reliant upon fire as a seed dispersal mechanism.

Once seed is dispersed, it enters the soil seed bank which is the natural storage of seeds within the rainforest. The seed often lies dormant awaiting disturbance to create favourable conditions for germination. In general:

Pioneer species grow fast, flower and produce small seed which can be held in the seed bank for a long period of time.

Secondary species produce larger, fleshier fruit and have short to medium term seed viability.

Mature species often have large fruit with short seed viability, however they can germinate in shade beneath the canopy, after which the seedlings can remain in stasis awaiting suitable disturbance to recommence growth.

Fungi

Fungi play a predominantly unseen but important role in littoral rainforest ecology. Fungi are the forest's primary decomposer and recycler of organic matter and nutrients, including nutrients from sea spray, by converting them into forms available to plants. For most of their life fungi remain hidden inside rotting wood or in the soil - only making a short appearance when it is time to reproduce. Many fungi species have a symbiotic relationship with plant species to the extent that the plants cannot survive without fungi, it is estimated that 75 to 90% of Australian plants rely on fungi to survive. *Eucalyptus, Melaleuca, Casuarina, Acacia* and *Syzygium* all have symbiotic relationship with fungi. However, some exotic fungi species can be a threat to plant species and ecosystems and in some instances can be more harmful than weeds.

Lichens, while not a fungi per se, are symbiotic organisms in which fungi and algae (or in some cases, cyanobacteria) work together to support each other. Lichens play an important role in the recycling of nitrogen within an ecosystem. Many littoral rainforest species such as Guioa (*Guioa semiglauca*), Tuckeroo (*Cupaniopsis anacardioides*) and Common Acronychia (*Acronychia obovatus*) can often house significant lichen populations on their bark.

Image Above: Lichen growing on the bark of a Guioa semiglauca

Fauna

Fauna provides an essential ecological role in littoral rainforest, particularly processes such as pollination and seed dispersal. Fauna uses the rainforest as foraging habitat because many rainforest plant species produce fruit as a part of their reproductive cycle. Many bird species, such as fig birds, bower birds and currawongs, are frugivores (fruit eaters) while flying foxes and some bird species, such as wattle birds and honey eaters are primarily nectarivores (nectar eaters) and rely upon plants in flower for food, although at times of nectar shortage some species will also eat fruit. Grazing species such as kangaroos and wallabies and ground foraging species such as bandicoots and echidnas also utilise the rainforest for food. Invasive animal species such as foxes, rats, rabbits, and deer also utilise the rainforest.

Weeds

Invasive weed species are an immediate and major threat to littoral rainforest ecology. Transformer weeds (See info box) such as Bitou Bush, Lantana, Ground Asparagus and Coastal Morning Glory pose significant threats to littoral rainforest.

TRANSFORMER WEEDS

TRANSFORMER WEEDS ARE INVASIVE SPECIES THAT CAN SIGNIFICANTLY CHANGE THE STRUCTURE AND FUNCTION OF ECOLOGICAL COMMUNITIES

Environmental weeds such as Giant Pidgeon Grass, Crofton Weed and Mother-of-Millions pose a threat but are unlikely to transform the ecosystem.

Weeds can enter a rainforest either by natural processes such as wind, or by birds and mammals which excrete seed, or they can be introduced by human activity such as people dumping green waste, “beautification” plantings, seed on people’s clothing (including coastcarers) or by urban stormwater.

Disturbed areas and rainforest edges are vulnerable to weed infestation, especially disturbed rainforest edges. Many weed species are seasonal and will pose annual threats while some weeds which respond to major disturbance such as fire, may remain an annual threat until the rainforest structure recovers and those weeds are shaded out.

Biosecurity

Some introduced fauna, flora, fungi and pathogens have proliferated and spread widely and inexorably into many parts of the country, destroying or threatening native species and ecosystems. Biosecurity threats are regulated in NSW through the Biosecurity Act 2015 (see info box)

BIOSECURITY ACT 2015

THE PURPOSE OF THE ACT IS TO PROTECT THE ECONOMY, ENVIRONMENT AND COMMUNITY FROM THE NEAGTIVE IMPACTS OF PESTS, DISEASES, WEEDS AND CONTAMINANTS.

Examples of biosecurity threats include Fauna: fox, rabbit, and cane toad. Flora: bitou bush, lantana, and ground asparagus. Fungi: chytrid fungus and myrtle rust. Pathogen: phytophthora.

Biosecurity threats can occur at species and ecosystem levels. Within littoral rainforest Chytrid Fungus, Myrtle Rust and Phytophthora pose unseen but extreme threats. Chytrid Fungus impacts frog species, especially the green tree frog, often resulting in death. Myrtle Rust impacts plant species within the Myrtaceae family including common rainforest genera such as *Syzygium, Eucalyptus, Melaleuca* and *Callistemon*, resulting in degradation and species extinction. The impact of Myrtle Rust is compounded after fire as the new growth, on recovering and newly germinated plants, is targeted by the rust. Phytophthora, also known as root rot or dieback, infects soil and prevents a significant number of plant species from taking up water and nutrients required to sustain life, Phytophthora can severely alter rainforest ecosystems.

CONSERVATION LEGISLATION

Conservation protection of littoral rainforest occurs at all three levels of government: Commonwealth Government, State Government and Local Government, as such it is a complicated and at times confusing web of legislation, policies, programs and plans.

Commonwealth Government

Two main protections exist at Australian Commonwealth Government level:

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) - Littoral Rainforest and Coastal Vine Thickets of Eastern Australia: The Conservation Advice is Critically Endangered ecological community (Date effective 10-Oct-2008).

The Act provides a Policy Statement to identify, assess and manage the Littoral Rainforest. *Policy Statement 3.9 - Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* can be found at: https://www.awe.gov.au/sites/default/files/documents/littoral-rainforest.pdf

The *National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community:* The Recovery Plan establishes a series of objectives, strategies and actions to:

- prevent the decline of the community
- to improve the extent and condition of the community
- to maximise the long-term persistence of the community

The Recovery Plan is significant to the activities of Wallabi Point Coastcare as our actions work towards fulfilling the objectives and outcomes of the Plan. A summary of the Recovery Plan is provided immediately following this section of the report.

State Government

The New South Wales State Government, through the NSW Department of Planning, Industry and Environment, has three primary sets of legislation and one management program to protect littoral rainforest:

Biodiversity Conservation Act 2016 (BC Act): *The BC Act replaced the Threatened Species Conservation Act 1995 (TSC Act*) The aim of the BC Act is to ensure a balanced approach to land management and biodiversity conservation in NSW. Core objectives of the Act are to conserve biodiversity at bioregional and state scales and to ensure the proper management of natural resources in the social, economic and environmental interests of the state, consistent with the principles of ecologically sustainable development. Under the Act the NSW Threatened Species Scientific Committee can:

- declare species critically endangered, endangered, vulnerable or extinct in NSW
- decide which ecological communities should be listed as critically endangered, endangered, vulnerable or collapsed ecological communities
- decide which key threats to native plants and animals should be declared key threatening processes under the Act

Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is declared as an Endangered Ecological Community in NSW

Coastal Management Act 2016 (CM Act): The CM Act promotes the management, use and development of the coastal environment. The Act establishes management objectives specific to defined management areas. These objectives are given effect by developing and implementing Coastal Management Programs (CMP) and site specifically by applying development controls in the new State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) and a local planning Ministerial Direction.

The Coastal Management SEPP includes state-wide mapping of littoral rainforest and repealed the previous State Environmental Planning Policy No. 26 Littoral Rainforests (SEPP 26). However, the SEPP 26 mapping was not comprehensive, and many stands of littoral rainforest were not included in the mapping

Environmental Planning and Assessment Act 1979 (EPA Act): The EPA Act is the primary law regulating land use in NSW. The Act allows plans to be made to guide the process of development and to regulate competing land uses. These are known as environmental planning instruments (EPIs). The EPA Act allows two types of EPIs to be made:

- Local environmental plans (LEPs); and
- State environment planning policies (SEPPs).

Local Government

Local Government manages locally significant native vegetation communities, rare species of flora, fauna and other sensitive environmental features, as well as control development through legislative instruments such as Local Environmental Plans (LEPs). LEPs guide planning decisions for local government areas through zoning and development controls. They provide a local framework for the way land can be developed and used. LEPs are the main planning tool used by Councils to ensure local development is carried out appropriately and that the environment is protected. LEP's must be consistent with State Government policies and regional and district plans. Council's policies also adhere to State Environmental Planning Policies (SEPP) such as the Coastal Management SEPP. Before a development consent can be determined the Council must consider the LEP, SEPPs and any relevant State Government Legislation.

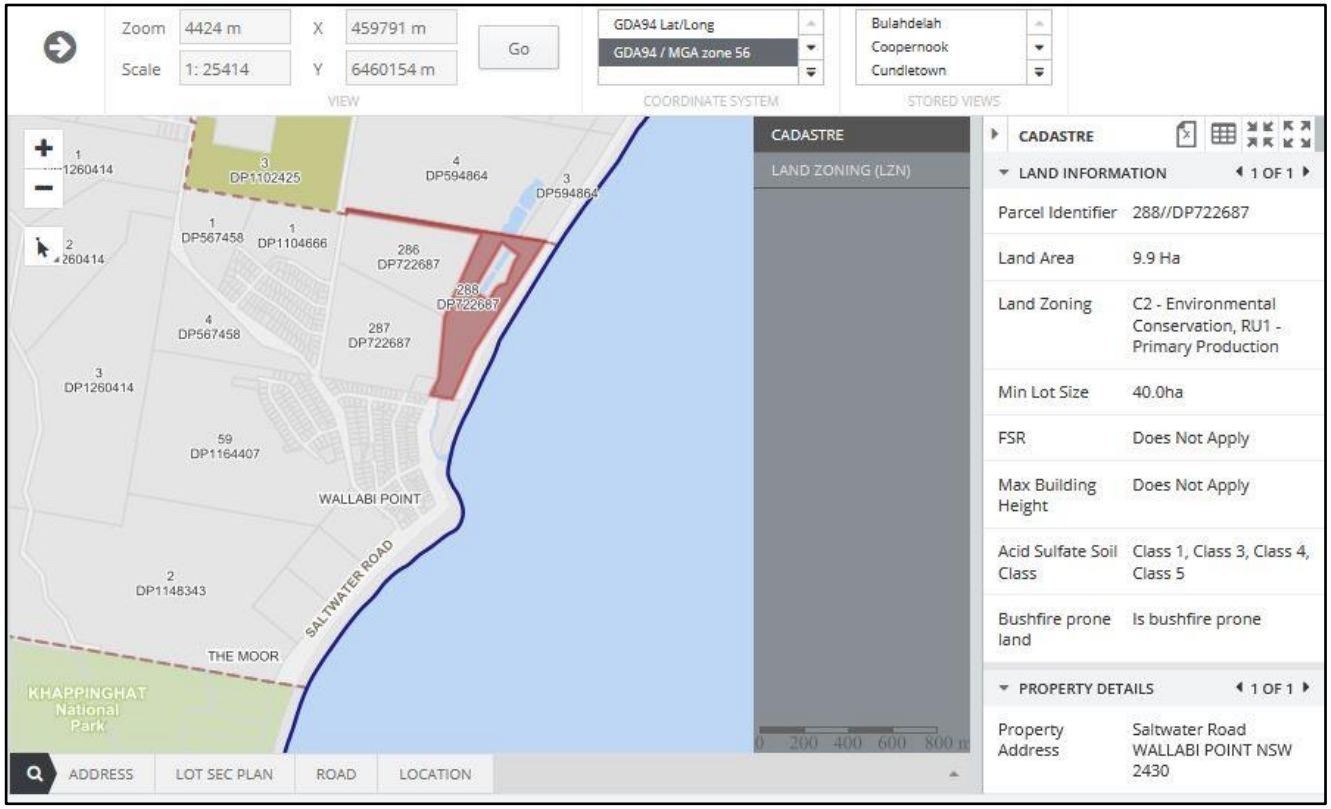


Image Right: MidCoast Council LEP Mapping of the Wallabi Point Littoral Rainforest site

***SOURCE**: https://www.midcoast.nsw.gov.au/Plan-Build/Stage-2-Rules-and-Regulations/Online-Mapping*

NATIONAL RECOVERY PLAN FOR LITTORAL RAINFOREST

The Australian Government Department of the Environment and Energy has prepared the ***National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community,*** to provide for the long-term survival and protection of the littoral rainforest and coastal vine thickets ecosystems which are listed as Critically Endangered under the Australian Government Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The objectives of the National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community (hereafter referred to as the Recovery Plan) are that by 2029:

a) The management actions necessary to stop the decline of the ecological community across its distribution are well understood and being implemented
b) The known extent (area) of littoral rainforest has been maintained or extended
c) The condition of the ecological community has been improved across its distribution
d) The chances of the long-term persistence of littoral rainforest in nature have been maximised.

The primary purpose of this Recovery Plan is to provide the research management actions necessary to stop the decline and to support the recovery of littoral rainforest so that the chances of its long-term survival in nature are maximised.

The National Recovery Plan can be found online in two parts:

- The Plan: http://www.environment.gov.au/system/files/resources/15aceb61-f751-4e7c-8a87-59e07a635072/files/recovery-plan-littoral-rainforest-coastal-vine-thickets.pdf
- Attachment A: Flora Species Lists by Region: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/76-species-lists.pdf

Significant strategies and actions to be undertaken in the Recovery Plan apply to Government legislation and scientific research, however we as a community through Coastcare can participate in the strategies and actions as follows:

Strategy 3: Restore and extend Littoral Rainforest: Through (a) Rehabilitation and restoration activities to restore vegetation structure and control invasive plant species, and (b) Actions to increase connectivity, enhance migration and create natural buffers.

Strategy 4: Engage with the public to increase awareness and community involvement in management and rehabilitation: Through: (a) Engaging with the public and local landowners and managers to promote the values of littoral rainforest, and to drive community involvement in management, and (b) Assist with funding applications for management and rehabilitation activities.

Strategy 3 directly impacts our rehabilitation strategy and action for the Wallabi Point littoral rainforest.

The best practice guidelines provide a methodology for the restoration of littoral rainforest, including strategies to:

- plant appropriate vegetation. (Responsibility: Wallabi Point Coastcare supported by MidCoast Council)
- improve condition and complexity. (Responsibility: Wallabi Point Coastcare supported by MidCoast Council)
- restore degraded patches. (Responsibility: Wallabi Point Coastcare supported by MidCoast Council)
- extend existing patches. (Responsibility: Wallabi Point Coastcare supported by MidCoast Council)
- establish natural buffers. (Responsibility: Wallabi Point Coastcare supported by MidCoast Council)
- improve connectivity. (Responsibility: Wallabi Point Coastcare supported by MidCoast Council)
- manage or reduce threats. (Responsibility: Wallabi Point Coastcare and MidCoast Council)
- prioritise investment at both a local and national scale. (Responsibility: Federal, State and Local Government)

PART 2 - WALLABI POINT LITTORAL RAINFOREST

BACKGROUND

The land on which the Wallabi Point littoral rainforest occurs is Crown Land in the care, control and management of MidCoast Council as the appointed Crown land manager. Under council's LEP the area is zoned C2 (Environmental Conservation) and is considered protected ecosystem. The site occurs wholly within the First Rock Gully catchment.

In 1998 Manning Coastcare Group surveyed weed species in 29 littoral rainforest locations from Crowdy Head in the north to Black Head in the south. The same sites were resurveyed in 2009. The surveys included sections of the Wallabi Point littoral rainforest. Two sections were surveyed, an area north-east of the township on the north side of first Rock Gully, and the strip of vegetation along the north side of the township adjacent to Marine Drive on the southern side of First Rock Gully.

The 1998 survey noted the following plant species: Beach Bird's Eye (*Alectryon coriaceus), Apple Berry (Billardiera scandens*), Willow Bottlebrush *(Callistemon salignus*), Native Grape *(Cayratia clematidea*), Hairy Clerodendrum *(Clerodendrum tomentosum*), Tuckeroo *(Cupaniopsis anacardioides*), Coffee Bush *(Breynia oblongifolia*), Prickly Leaved Paperbark *(Melaleuca* nodosa), Variable Leaf Muttonwood *(Myrsine variablis*), Native Guava *(Rhodomyrtus psidioides*), Wonga Wonga Vine *(Pandorea pandorana),* Pearl Vine *(Sarcopetalum harveyanum*), Snake Vine *(Stephania japonica*), *Climbing Guinea Flower (Hibbertia scandens*).

Upon formation of the Wallabi Coastcare group a species list was developed and maintained by group member, Rose Van Hilt, following a "walk through" of the forest with council's Natural Assets Environmental Officer, Anthony Marchment. That species list became the basis of the species list presented in this report as Attachment A.

In 2018, as part of its Biodiversity Conservation Framework, MidCoast Council engaged North Coast Aerial Mapping to map, describe and assess littoral rainforests across the local government area. The Wallabi Point littoral rainforest is designated as a floristic group described as *"Group 5: Tuckeroo, Coast Banksia, Yellow Tulip and Mock Olive Littoral Rainforest" (For above floristic group details see Attachment B: Littoral Rainforests in the MidCoast Council LGA draft report May 2019 - North Coast Aerial Mapping).* The process of mapping included aerial photographic interpretation and ground truthing. The mapping clearly identifies the area north of First Rock Gully as littoral rainforest (Figure 4).

Figure 4: MidCoast Council Littoral Rainforest Mapping 2019 from Old Bar to Saltwater

The coast between Manning Point and Hallidays Point was surveyed between 7-10 August 2018 during an extreme dry spell leading into the severe drought of 2019 and the wildfire in November that year. Rapid assessment plots and a lesser number of full floristic survey plots were established. Surveys were conducted at Old Bar and Saltwater but none within the Wallabi Point littoral rainforest. Two existing floristic plots have been monitored south of the Old Bar settlement and north of the sewage exfiltration ponds.

Aside from the reports and based on observation it is worth noting that two plant species, of which there was only one known representative of each, have been lost following the fire and the March 2021 rain event. Rough Leaved Elm (*Aphananthe philippinensis*) survived the immediate fire but failed to survive the ensuring year and Brush Box (*Lophostemon confertus*) died following the rain event, possibly due to its location next to a stormwater culvert and heavily saturated soil.

The exotic fungi species, Myrtle Rust (*Austropuccinia psidii*) and Chytrid Fungus *Batrachochytrium dendrobatidis*) are present on site. Myrtle Rust infects plants of the Myrtaceae family while Chytrid Fungus can lead to frog mortality.

LOCAL CONSERVATION & PROTECTION

The primary focus for conservation and protection is at State and Local Government levels (See Conservation Legislation section page 8).

At State Government level through the Biodiversity Conservation Act 2016 and the Coastal Management Act 2016 and the CM Act's associated Coastal Management SEPP.

At Local Government level through the Local Environment Plan (LEP) and associated zoning.

Currently the Wallabi Point littoral rainforest occurs on Crown Land in the care, control and management of MidCoast Council as the appointed Crown land manager. Under council's LEP the area is zoned C2 (Environmental Conservation) and is considered protected ecosystem.

At the time of writing (August 2021) MidCoast Council is preparing the Coastal Management Program for the Manning River as per the requirements of the Coastal Management Act 2016. Two separate programs are being prepared:

a) *Manning River Estuary and Catchment Management Program*: Commences two kilometres upstream of the river mouth at Harrington (the confluence of the Manning and Lansdowne Rivers) upriver to the source of the Manning and contributories. Draft Program document adopted by Council August 2021

b) *Old Bar – Manning Point Coastal Management Program*: The Old Bar to Manning Point coastal zone is considered a 'Coastal Hot Spot' due to coastal erosion. The preparation of the program is behind schedule.

It is through the Coastal Management Program and the Coastal Management SEPP that the highest level of conservation and protection of the Wallabi Point littoral rainforest exist. In 2018 Council engaged independent vegetation mapping consultants, the mapping (report dated May 2019) identified the Wallabi Point littoral rainforest covering an area of around 3 hectares (Note: The South Zone, adjacent to Marine Drive, was excluded from the mapping).

To be effective it will be a requirement that Council provide the littoral rainforest map layer to the State Government for adoption as part of the Coastal Wetlands and Littoral Rainforests Area Map under SEPP (Coastal Management) 2018

COMMONWEALTH
EPBC Act LISTING FOR LITTORAL RAINFOREST: CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY
ONE PLANT SPECIES IS EPBC Act LISTED. Rhodomyrtus psidioides (NATIVE GUAVA): CRITICALLY ENDANGERED SPECIES

NSW
BC Act LISTING FOR LITTORAL RAINFOREST: ENDANGERED ECOLOGICAL COMMUNITY
ONE PLANT SPECIES IS BC Act LISTED. Rhodomyrtus psidioides (NATIVE GUAVA): CRITICALLY ENDANGERED SPECIES
COASTAL MANAGEMENT SEPP: WALLABI POINT LITTORAL RAINFOREST IS CURRENTLY NOT INCLUDED IN MAPPING BUT WITH NOMINAL CONSERVATION PROTECTION

MIDCOAST COUNCIL
LEP LAND USE ZONE: C2 – ENVIRONMENTAL CONSERVATION: "AREAS WITH HIGH ECOLOGICAL, SCIENTIFIC, CULTURAL OR AESTHETIC VALUES OUTSIDE NATIONAL PARKS AND NATURE RESERVES. THE ZONE PROVIDES THE HIGHEST LEVEL OF PROTECTION, MANAGEMENT AND RESTORATION FOR SUCH LANDS WHILST ALLOWING USES COMPATIBLE WITH THOSE VALUES."
LAND TENURE: CROWN LAND IN THE CARE, CONTROL AND MANAGEMENT OF MIDCOAST COUNCIL
COUNCIL VEGETATION MAPPING: INCLUDED IN THE 2018 LITTORAL RAINFOREST MAPPING (WAS NOT MAPPED PRIOR TO 2018)

CONSERVATION OF WALLABI POINT LITTORAL RAINFOREST – COASTAL MANAGEMENT SEPP
THE HIGHEST LEVEL OF ENVIRONMENTAL CONSERVATION AND PROTECTION FOR THE WALLABI POINT LITTORAL RAINFOREST IS TO ENSURE IT IS INCLUDE IN THE COASTAL MANAGEMENT SEPP. THIS WILL REQUIRE MIDCOAST COUNCIL PROVIDING UPDATED MAPPING AND SITE DATA TO THE NSW DEPARTMENT OF PLANNING AND ENVIRONMENT REQUESTING THE NEW MAPPING BE INCLUDED IN THE COASTAL MANAGEMENT SEPP.
NOTE: COASTAL MANAGEMENT SEPP LISTING CAN BE OVERIDDEN BY THE STATE GOVERNMNT DECLARING A PROJECT TO BE EITHER A REGIONALLY OR STATE SIGNIFICANT DEVELOPMENT

SITE LOCATION

There are two zones to the Wallabi Point littoral rainforest (Figure 5). A South Zone and a North Zone. Both zones have significant variations in structure and management issues making each zone worthy of its own analysis.

The zones occur either side of First Rock Gully, a brackish but permanent waterway. Water levels and salinity vary with the intermittent opening and closing of the gully to the ocean. When the gully is closed to the ocean the water levels can increase and inundate foreshore areas, this may remain so for a period until water levels drop, either through filtration through the sandy substrate or via the gully opening to the ocean.

The total site runs in a south to north direction. The southern boundary being the North Wallabi concrete pathway. The northern boundary at the sewage exfiltration ponds.

The site is 675 metres long and an estimated average width of 35 to 40 metres. The site area is estimated at 2.5 hectares although prior to the 2019 fire the estimated area was 3.5 hectares.

A flora and fungi species list for the site is attached as Attachment A: *'Wallabi Point Littoral Rainforest Flora and Fungi Species List'*, and the weed species list is attached as Attachment C: *'Wallabi Point Littoral Rainforest Weed Species List'*.

Figure 5: Wallabi Point Littoral Rainforest Map

Image Above: First Rock Gully, Littoral Rainforest Seaward Edge and Wallabi Point Township

SOUTH ZONE

The South Zone (Figure 6) occurs west and south of First Rock Gully, running parallel to Marine Drive and the residential development of Wallabi Point.

Structural Type: A mixture of headland and sand dune littoral rainforest. Towards the south end, near the concrete pathway, the forest tends more towards the headland structural type with low wind sheared vegetation and vine thickets. Further north the structure is sand dune structure, although soil pushed down slope from the construction of Marine Drive results in a mixture of igneous derived soil and sand.

Dominant Canopy: Tuckeroo (*Cupaniopsis anacardioides*), Lilly Pilly (*Syzygium smithii*), Hard Quandong (*Elaeocarpus obovatus*), Coastal Banksia (*Banksia integrifolia subsp. integrifolia*), Guioa (*Guioa semiglauca*), Beach Bird's Eye (*Alectryon coriaceus*)

Dominant Vines: Pearl Vine (*Sarcopetalum harveyanum*), Snake vine (*Stephania japonica*), Austral Sarsaparilla (*Smilax australis*), Twining Guinea Flower (Hibbertia scandens)

Dominant Mid Story: Coffee Bush (*Breynia oblongifolia*), Gahnia spp., Swamp Lily (*Crinum pedunculatum)*, Bleeding Heart (*Homalanthus populifolius*), Mock Olive (*Notelaea longifolia*), juvenile canopy species

Dominant Ground Cover: Weeping Meadow Grass (*Microlaena stipoides*), Right Angle Grass (*Entolasia marginate*), Creeping Beard Grass (*Oplismenus imbecillis*), Native Hydrocotyle (*Hydrocotyle sibthorpioides)*, Scurvy Weed (*Commelina cyanea*), Rasp Fern (*Doodia aspera*), Common Matt Rush (*Lomandra longifolia*)

Transformer Weeds: Bitou Bush, Lantana, Ground Asparagus, Coastal Morning Glory, Buffalo Grass, Madeira Vine, Winter Senna

Figure 6: South Zone Map

Common Weeds: Climbing Asparagus, Wild Tobacco, Kikuyu Grass, Giant Pidgeon Grass, Rhodes Grass, Crofton Weed, Billy Goat Weed, White Passionfruit, Moth Vine

Plant Species List: See Attachment A: '*Wallabi Point Littoral Rainforest Flora and Fungi Species List*'

Condition of Rainforest Canopy: In mixed condition. The mature Tuckeroos, Hard Quandongs and Lilly Pillies were able to resist scorching, however coastal banksias were significantly damaged. Towards the north end of the zone, near the sewage pumping station, significant damage occurred. Canopy height is variable from 2 to 8 metres with exposure to oceanic winds being the primary height inhibiter.

Condition of Seaward Buffer: First Rock Gully separates the rainforest from the foredunes with saltmarsh along the western side of the gully to the edge of the rainforest, resulting in a seaward buffer as a modified headland wind sheared edge. Seaward migration of the edge is limited by plant response to variable water levels in the gully and soil. Significantly damaged by the fire.

Condition of Landward Buffer: No landward buffer as the rainforest abuts Marine Drive.

Past Disturbance: Sand mining did occur, although on the northside of the gully, while in the south zone unusual sand placement, from possible spoil mounds, may indicate significant disturbance from the sand mining. Anecdotal information from residents indicates that dumping of waste material from urban development and road building, occurred near the pumping station on Marine Drive. Other signs of past disturbance include mature Lilly Pilly tree species growing in coppice patterns although the actual cause is unknown and could include attempted tree removal or fire.

Management Issue - Fire Disturbance: There are several impacts following the 2019 fire. These impacts are a result of the rainforest not able or slow to regenerate after the fire. The impacts being:

a) Reduced extent (area of littoral rainforest)
b) Loss of seaward edge
c) Reduced and-or loss of biodiversity
d) Reduced health condition of the rainforest
e) Damaged natural buffers
f) Reduced connectivity between zones and patches

Of note is the continued die-off of canopy tree species, especially Coastal Banksia (*Banksia integrifolia*), it is possible the plants have not been able to recover from dual stress factors of drought and fire.

Management Issue - Stormwater: Four stormwater entry points exist along Marine Drive. Stormwater is one of the primary methods by which weeds enter the site, as evidenced by the weed plumes that extend out from the stormwater flow path. Monitoring of potential erosion issue is required. The major outlet occurs from the culvert from Beach Street where a significant weed plume exists and will be difficult to contain into the future. At the south end of the site (opposite No. 33 Marine Drive) there is a culvert diverting stormwater from Marine Drive into the rainforest from which a significant weed plume emerges. At the north end stormwater enters the site at two locations from overland flow (including the road). Stormwater is a difficult management issue as directing stormwater into bushland is an environmental legacy issue which councils do not want to deal with, but it is ultimately MidCoast Council's responsibility.

Management Issue - Periodic inundation from flooding: Elevated water levels (flooding) and inundation of higher ground can negatively impact plant development and cause weed propagule dispersal over a larger area. After flood events, Coastcare and council contractors, should be aware of the weed management issue and monitor for new infestations disconnected from existing infestations.

Management Issue - Tree Vandalism: Tree vandalism is the unlawful destruction, damage, or injury to trees through methods including, but not limited to, poisoning, pruning, cutting, ringbarking, or removal. Along foreshore areas the main motivation for tree vandalism can be to improve views and property values. Coastcare can monitor vegetation for unlawful damage and removal and report same to Council, but compliance enforcement is a management issue for MidCoast Council.

Management Issue - Green Waste Dumping: The dumping of green waste from household gardens introduces weeds onto the site especially grasses such as Kikuyu and Buffalo but also garden plants such as Spider Plant, Monstera and Madeira Vine. Coastcare can remove weeds introduce by green waste dumping, but it is MidCoast Council's responsibility to address persistent dumping.

Management Issue - Beautification Plantings: Beautification might sound like a good idea, but it often introduces weeds into bushland. Such plantings may include left over garden plants that a resident could not bring themselves to throw out, exotic trees or native trees not indigenous to the area that someone plants because they "look nice" or they may even be memorial plantings to remember a loved one. These are management issues for MidCoast Council.

Management Issue - Coastal Erosion: Although not an immediate issue coastal erosion is an obvious and serious threat. Management issue for MidCoast Council.

Management Issue - Myrtle Rust: Myrtle Rust is present on the site and is responsible for the poor condition of surviving, and BC Act critically endangered Native Guava (*Rhodomyrtus psidioides*). The die-off is so severe it is a possible local extinction event. Management issue for NSW Office of Environment and Heritage and MidCoast Council.

Image Above: Beach Street stormwater culvert a major source of weed species

NORTH ZONE

The North Zone (Figure 7) has two distinct vegetation associations based on the dominant canopy species within their boundaries. A Tuckeroo-Guioa vegetation association in the north and a Tuckeroo-Paperbark vegetation association in the south.

Structural Type: Sand dune littoral rainforest.

Dominant Canopy - Tuckeroo-Guioa Vegetation Association*:* Tuckeroo (*Cupaniopsis anacardioides*), Guioa (*Guioa semiglauca*), Beach Bird's Eye (*Alectryon coriaceus*), Coastal Banksia (*Banksia integrifolia subsp. Integrifolia*)

Dominant Canopy - Tuckeroo-Paperbark Vegetation Association*:* Tuckeroo (*Cupaniopsis anacardioides*), Willow Bottlebrush (*Callistemon salignus*), Prickly Leaved Paperbark (*Melaleuca nodosa),* Guioa (*Guioa semiglauca*), Coastal Banksia (*Banksia integrifolia subsp. Integrifolia*), Coast Canthium (*Cyclophyllum longipetalum*), Satinwood (*Nematolepis squamea*), Corkwood (*Duboisia myoporoides*)

Dominant Vines: Pearl Vine (*Sarcopetalum harveyanum*), Snake Vine (*Stephania japonica*), Wonga Wonga Vine (*Pandorea pandorana*)

Dominant Mid Story: Coffee Bush (*Breynia oblongifolia*), juvenile canopy species

Dominant Ground Cover: Creeping Beard Grass (Oplismenus imbecillis), Sickle Fern (Pellaea falcata), Settlers Flax (*Gymnostachys anceps)*

Common Weeds: Bitou Bush (light restricted), Lantana (light restricted), Ground Asparagus, Winter Senna, Brazilian Nightshade.

Plant Species List: See Attachment A: '*Wallabi Point Littoral Rainforest Flora and Fungi Species List*'

Figure 7: North Zone Map

Condition of Rainforest Canopy: Generally, in good condition, although patchy in the south end of the zone and significantly damaged in the north end for approximately 50 metres from the sewage exfiltration ponds boundary. The canopy is 8 to 12metres in height.

Condition of Seaward Buffer: Highly degraded by the 2019 fire. Bitou Bush has heavily infested the foredune zone (see cover photo) to the edge of the rainforest. Currently, the Bitou is providing a physical buffer for the rainforest.

Condition of Landward Buffer: Highly degraded by the 2019 fire. Significant death of canopy species and incursion into the zone of Lantana, Bitou Bush and *Acacia longifolia*, as a post fire response.

Past Disturbance: Apart from the minor sand mining at the southern end of the zone, adjacent to First Rock Gully, there appears to be little disturbance apart from the construction of the sewage exfiltration ponds at the northern boundary. There is no physical evidence of the road that existed between Wallabi Point and Lewis Street, Old Bar. Myrtle Rust die-off has impacted two sections of the forest.

Management Issue - Fire Disturbance: There are several impacts following the 2019 fire. These impacts are a result of the rainforest not able, or slow, to regenerate after the fire. The impacts being:

a) Reduced extent (area of littoral rainforest)
b) Loss of seaward edge
c) Loss of landward edge vegetation
d) Reduced and-or loss of biodiversity
e) Reduced health condition of the rainforest
f) Damaged natural buffers
g) Reduced connectivity between zones and patches

Management Issue - Myrtle Rust: Myrtle Rust is present on the site and is responsible for the poor condition of surviving and BC Act critically endangered Native Guava

(*Rhodomyrtus psidioides*) (See Images opposite). The die-off is so severe it is a possible local extinction event. Myrtle Rust is wind dispersed and difficult to contain and as such is difficult to treat in the wild. Management issue for NSW Office of Environment and Heritage and MidCoast Council.

Management Issue - Bitou Bush Infestation: Bitou Bush is becoming a monoculture along the seaward buffer following extensive fire damage to the foredunes and council's decision to suspend aerial spraying following community opposition to the use of Glyphosate herbicide. This is an issue beyond the resources of Coastcare and is a management issue for MidCoast Council.

Management Issue - Sewage Treatment Plant Boundary: the construction of the sewage exfiltration ponds on the site of what was littoral rainforest has created a vulnerability point where light and wind have altered the structure of the vegetation in the northern extent of the zone. The fire, fed by a shift to weeds and sclerophyll species around the STP assets, burned hotter than elsewhere in the rainforest causing the most extensive damage including the death of the entire canopy for 50 metres south of the boundary. Management issue for MidCoast Water Services and MidCoast Council.

Management Issue - Coastal Erosion: Although not an immediate issue coastal erosion is an obvious and serious threat. Management issue for MidCoast Council.

Image Above: Myrtle rust infection on the growing tip of Rhodomyrtus psidioides (Native Guava). The rust attacks the growing tip, new growth and flowers of the plant preventing fruit development.

Image Above: Myrtle rust damage on the leaf of Rhodomyrtus psidioides (Native Guava).

Image Right: Coastal erosion adjacent to the rainforest seaward edge (looking south from Old Bar)

PART 3 FIRE - ECOLOGY, DISTURBANCE & RECOVERY

Fire Ecology

Littoral rainforest is generally regarded as being fire sensitive and subject to infrequent wildfires. Fire is a major disturbance event of rainforests.

Historically the absence of fire over long intervals has been the driver for successional development of rainforests from sclerophyll forest to mesophyll rainforest, a cool, moist and windless microclimate which can act to reduce the intensity of fire.

NSW State Guidelines for fire intervals list littoral rainforest as: *'Fire Should Be Avoided',* as such both *Minimal* and *Maximum* fire intervals are not applicable. Appropriate fire regimes should be maintained

The extreme fire season on the NSW coast generally runs from October through to January although conditions are routinely monitored by the NSW Rural Fire Service and advice may change as the conditions dictate.

The extreme fire season is characterised by:

a) Higher mean temperatures
b) Lower humidity
c) Strong winds out of the north to southwest cardinal and intercardinal directions

Successive fire events in short periods of time, and increased fire intensity, pose an existential threat to littoral rainforest and especially to small, isolated stands. Each successive fire will reduce biodiversity and the ability of the ecosystem to recover. However, some rainforest plant species are capable of re-sprouting, coppicing, or suckering following low-intensity fires while some other species may be lost.

Under the closed canopy, fuel loads are low because of a thin midstory, minimal organic matter and moister microclimate. Along the edges fuel loads derived from highly flammable woody weeds such as Bitou Bush and Lantana, increase the risk of high levels of edge disturbance from fire.

Fire affects the physical, chemical, and biological properties of soil condition. Fire mostly impacts the organic surface material and upper soil layers which contain soil nutrients and fungi. Following fire, soils can become hydrophobic (water repellent). Soil recovery relies upon the recovery of vegetation: the quicker the bush recovers, the quicker the soil recovers.

Disturbance and Damage

The pre fire extent of the Wallabi Point littoral rainforest was estimated at 3.5 hectares. The post fire extent is estimated to be reduced to 2.5 hectares with 0.5 hectare of undamaged canopy.

The 2019 fires occurred during drought conditions. The average annual rainfall recorded for Taree Airport is 1178.8mm per annum. In the previous 5 years (2014 to 2018) rainfall was below average. The total rainfall January to October 2019 was 381.5mm and in the six months leading up to the fire, May to October, just 171.5mm of rain was recorded. The conditions were conducive to fire.

The main fire front moved in from the south and encircled the township. The rainforest, being on the north side of the township, was protected from the worst of the fire by the residential area.

The northern extent of the forest in the North Zone, adjacent to the sewage exfiltration ponds boundary, experienced the hottest burn and subsequent damage. There was a heat gradient across the site from a hotter burn in the northern section and a cooler burn towards the southern section. The intensity of the burn was not consistent, with isolated patches experiencing hotter burns and greater damage (Figure 8).

Figure 8: Post Fire Disturbance Map

In the North Zone an area of 0.5 hectare of the canopy did not burn or suffer radiant heat damage because of

(a) the closed canopy structure being composed almost totally of mesophilic species, and (b) the small amount of vegetation and fuel at the ground level under the dense canopy. Under the canopy the burn was much cooler but resulted in a bare forest floor with damage to herbaceous plants, saplings, and vines.

Having burnt cooler and slower through the rainforest the fire intensified when it reached the foredune and became a hotter burn through to the beach. On the foredune some Tuckeroo and Coastal Banksia did survive but the Coastal Tea Tree population was severely damaged, thus losing the protective eastern seaward edge of the forest. The western landward edge of the zone was comprised of two distinct communities. The northern section was Lomandra grassland with intermittent Coastal Wattle and more dominant Coastal Tea Tree, the southern section an ecotone of rainforest species and Melaleuca scrub. Both these zones were burnt through.

In the South Zone the fire burnt slow and cool over several hours. Like the North Zone some areas of the canopy did not burn or suffer radiant heat damage, however there were smaller areas where the fire burnt hotter resulting in higher levels of disturbance.

Notably different from the north zone were the number of damaged canopy species that either died over time or coppiced from the base after a period, this was especially prevalent with Tuckeroos and Lilly Pillies. Although the burn through the rainforest was cool it still inflicted significant damage to the ground layer which was left bare and to vine species which have been slow to naturally regenerate.

The main damage to the South Zone was the loss of the eastern seaward edge of the forest resulting in the forest being exposed to wind and salt and subsequent damage to already stressed plants. Some She Oaks that survived the fires did not survive the strong north-east winds over resulting summers and fell, while exposed plants suffered salt scalding and suppression of new growth. Invasion by weeds, including transformer weed species, commenced almost immediately.

Recovery - Natural Regeneration

The site has demonstrated high levels of resilience (see info box) having been in relatively healthy condition apart from pre-existing weed infestations.

RESILIENCE

RESILIENCE IS THE INHERENT ABILITY OF AN ECOSYSTEM TO ABSORB DISTURBANCES AND REGENERATE WHILE UNDERGOING CHANGE AND MAINTAINING ECOSYSTEM FUNCTIONS.

Significant rain fell over summer 2019-20 and continued over 2020-21 and into 2022. The rain, including the 1 in 100-year flood event delivering 600+mm in a week in March 2021, has promoted vigorous germination and growth.

Plant species regeneration after disturbance can occur through several natural methods, some species can regenerate from seed, some from coppicing, some from epicormic growth. Understanding each of the recovery modes are important when planning the post fire recovery:

- *Coppice - resprout from base*. New growth from the stump or the roots of a plant (*suckering*) after the trunk or roots have been damaged (See image right).
- *Epicormic Growth - resprout from trunk or branch*. Growth of new shoots from epicormic buds that lie dormant beneath the trunk and branch bark. The epicormic buds are suppressed until the plant experiences stress then the buds are activated.
- *Seed - in the seedbank*. Germination of seed stored in the soil or on damaged plants. Seed can be activated by post fire chemical changes in the soil, increased available light or lack of competition for resources
- *Seed - from offsite*. Germination of seed bought on site by natural methods such as birds, animals, wind, or water
- *Dead*. Some plant species are not tolerant of fire and entire populations may die (such as Coastal Tea Tree) or be significantly reduced (such as Coastal Banksia) and will be reliant on seed from the seedbank or offsite to repopulate the site

Image Above: Tuckeroo coppicing from the base (Photo: Anne Rourke)

A summary of recovery modes for the most common species in the Wallabi Point littoral rainforest is provided in Attachment D: '*Key Plant Species Fire Recovery Modes'*

The most prevalent first coloniser species after the fire were the native Kangaroo Apple (*Solanum aviculare*), Blady Grass (*Imperata cylindrica*) and the weeds Blackberry Nightshade and Bitou Bush.

In the south zone in areas where sunlight could reach the ground level native grasses, such as Weeping Meadow Grass (*Microlaena stipoides*) and Right-Angle Grass (*Entolasia marginata*) germinated readily from seedbank stored seed, while the exotic grasses Kikuyu and especially Buffalo, grew rapidly and in some areas completely out competed the native grasses. The transformer weeds, Bitou Bush, Coastal Morning Glory and Ground Asparagus followed shortly after as the summer of 2019-20 became very wet.

In the north zone the soil borne weed seedbank was much less than the south zone and regenerating pioneering native species dominated. Ground Asparagus under the canopy, reshooting from crowns, was slow to recolonise and 18 months after the fire was only starting to become an issue. Along the landward edge, Lantana and Bitou Bush, took advantage of the reduced canopy as did the native Golden Wattle (*Acacia longifolia*) which may become a fire hazard in several years when it commences to die off. The northern section, adjacent to the sewage exfiltration ponds where the fire was at its hottest and canopy damage extensive, Bitou Bush has dominated the area. On the seaward edge Bitou Bush has dominated the foredunes but has provided an edge which protects the rainforest. The Bitou Bush infestation has become extensive.

Image: Above Left – Burnt out rainforest.

Image: Above Right – Ground Asparagus infestation after fire

Image: Left – Burnt out seaward edge on foredune with Bitou Bush infestation.

(All photos: Anne Rourke)

POST FIRE REHABILITATION PRIORITIES

In the immediate aftermath of the fire, it is important to make observations of the damage and to set priorities. The following sequential steps are recommended:

Step 1: Maintain Species Lists

Before the fire, always maintain current plant species list (Attachment A) as a baseline reference and prepare notes on forest structure as per the "Wallabi Point Littoral Rainforest" section of this report on page 11.

Step 2: Fire Damage Observations

Immediately after the fire, observe damage to the forest structure. Note damage to the following:

- *The edge of the forest along the seaward buffer*. Has the rainforest edge been damaged? How extensive is that damage? What is the condition of surviving plant species? What species have been impacted? Will they survive? What are their recovery modes? Will they naturally regenerate, or will they need assistance? What is the condition of the vegetation zone between the rainforest seaward edge and the beach? Is there a high probability of salt scalding to the rainforest?
- *The canopy of the core rainforest.* Did it burn or is it just scorched? Will it regenerate or is it in danger of dying? Are there obvious areas where the canopy has been destroyed and will require priority attention? Will those areas require revegetation, rehabilitation, or a combination of both in the form of assisted natural regeneration?
- *The edge of the forest along the landward buffer*. Has the edge been damaged? How extensive is that damage? What is the condition of surviving plant species? What species have been impacted? Will they survive? What are their recovery modes? Will they naturally regenerate, or will they need assistance?
- *The midstory*. How extensive is the damage? What is the condition of surviving plant species? What species have been impacted? Will they survive?
- *Vine species that are vulnerable to fire*. Are vines still present? What species have been impacted or lost? What is the condition of surviving plant species? Will they survive? What are their recovery modes? Will they naturally regenerate, or will they need assistance?
- *Ground cover.* Possibly extensively damaged. Are there obvious survivors? Is there a seedbank to aid recovery?
- *Green islands*. Are there patches of vegetation (green islands) that survived the fire with minimal to no damage? How healthy are the local rainforest species in the surviving vegetation? What are the weed issues? What actions are required to conserve native biodiversity and ecosystem resilience?

Step 3: Assess the Burn Spatial Impact

Immediately after the fire, observe and assess the burnt and surviving forest and map out the intensity of the burn.

- Hot burn areas will be extensively damaged and can be identified by damage to the canopy with burnt leaves and to a slightly lesser degree, scorched leaves from radiated heat, while the trunks of trees will be extensively blackened, and white ash will be observed on the ground.
- Cool burn will be less damaged and have a better recovery potential, they will have lost ground cover and the layer of organic matter, tree trunks will have minimal blackening and tree canopy will look undamaged.
- Green Islands of vegetation, the unburnt islands of green, will be an important seed source of natural regeneration and should be protected immediately.

Step 4: Pioneer Species Propagation

Fast growing but sometime short-lived pioneer plants will be required as soon as possible to commence the regeneration process. Even without having developed a Rehabilitation Strategy (Step 6.) but having completed '*Step 2 Fire Damage Overview'* and '*Step 3 Assess the Burn and Spatial Impact'*, commence the process of obtaining the plants you will need to assist natural regeneration.

Coastcare members could start propagation in their own backyards. The quickest results will happen with propagation through cuttings rather than seed, fortunately many fast-growing pioneer species are easily reproduced via cuttings. As the successional development of the forest commences other slower growing pioneer species and secondary species will replace the fast-growing but short-lived pioneer species as they die off.

Council's two nurseries at Tuncurry and Taree could also assist with propagation. Some species may already be in stock, however apart from post disturbance events such as fire, there is little demand for these species and the nursery will have to start propagation as quickly as possible.

Examples of suitable fast-growing, short lived pioneer species include: Bleeding Heart (*Homalanthus populifolius*), Kangaroo Apple (*Solanum aviculare),* Coastal Wattle (*Acacia longifolia* subsp. *sophorae*), Native Rosella (*Hibiscus heterophyllus*), Brush Kurrajong (*Androcalva fraseri*) and Coastal Boobialla (*Myoporum boninense).*

See Attachment E: *'Wallabi Point Littoral Rainforest Species Planting Guide',* a comprehensive guide as an aid in selecting suitable propagation species.

The council nurseries could also commence additional production of seaward edge salt tolerant species such

as Beach Birds Eye (*Alectryon coriaceus*) and Coastal Banksia (*Banksia integrifolia* subsp. *integrifolia**)***. It is advised to place orders with council nurseries as soon as possible to secure supply especially if fires have been widespread.

Step 5: Weed Assessment

In the first weeks of recovery, look to see what weeds are growing and where, and ask yourself if they can be used to assist natural regeneration before commencing complete weed removal.

- Strategic weed use: The consequences of weed removal should always be considered before weeds are removed, although some weeds can pose a long-term impact, in the short term they could be used to an advantage. It is important to monitor sites where weeds are being used strategically and to decide when their job is done and to remove them. Transformer weeds should only be used in the most necessary of circumstances, where an external threat to the ecosystem is greater than the transformer weed threat, such as the use of Bitou Bush on the seaward edge to reduce the impact of salt laden winds. Environmental weeds could also be used strategically. For example: Wild Tobacco can be used to create habitat in areas of edge and canopy damage to provide quick growing structure which is required to assist rehabilitation of native species. Elsewhere in the forest the Tobacco can be removed. Tobacco will also bring in frugivore bird species that will help reseed the forest. Blackberry Nightshade can be dominant after the fire, but it provides a quick and ready source of food for frugivore species especially if fire damage is extensive across the landscape, over the next year the species does not compete well with native regeneration and 12 months after the fire it will generally not be an issue. Put bluntly, after the fire don't waste valuable time and energy dealing with a 'weed' that won't be a problem next season.
- Invasive weed removal: Once weed species have been assessed for their possible use to assist natural regeneration, consideration should be given to those weed species which pose the most immediate threat to the recovery and biodiversity of the forest. Focus on transformer weeds and weeds listed as "controlled" under the Biosecurity Act (formerly known as Noxious Weeds) and develop a strategy for their removal or control.
- Annual weeds: Over the next year, observe the weeds with seasonal patterns such as Crofton Weed, Cape Gooseberry, Noogoora Burr and Stinking Roger and manage them before they flower and fruit.
- New weed species: The cleared canopy and ground cover after the fire provide a suitable environment for new weeds to enter the site. Some of those new weeds can become a major management issue over time. Monitor for new weeds such as Glory Lily, Bridal Veil Creeper, Cat's Claw Creeper and Cape Ivy which can pose serious threats if they establish on site.
- Ask for help with weeds: It can be difficult to overcome the urge to pull out every weed, while the decision to strategically use weeds can be confusing. MidCoast Council and Landcare are there to help, so do not hesitate to ask for assistance.

Step 6: Post Fire Rehabilitation Strategy

Establish a post fire rehabilitation strategy (See Attachment G). Take what you have assessed and learned from Steps 2 to 5 above and start considering your long-term rehabilitation strategy. Focus on the issues and damage to repair those areas which if not addressed, could result in permanent damage and loss of structure and biodiversity to the forest.

The most likely areas requiring attention will be:

- *Damaged seaward edge* - consider the use of rapidly growing pioneer species such as Bleeding Heart (*Homalanthus populifolius*), Native Rosella (*Hibiscus heterophyllus*), Brush Kurrajong (*Androcalva fraseri*) and Coastal Wattle (*Acacia longifolia* subsp. *sophorae*) as well as weed species such as Bitou Bush and Wild Tobacco to seal the disturbed edge as quickly as possible
- *Seriously damaged canopy* - creating gaps in the forest. Use the rapidly growing pioneer species as listed above, plus moderate growth secondary and mature species such as Lilly Pilly (*Syzygium smithii* & *Syzygium oleosum*), Hard Quandong (*Elaeocarpus obovatus*), Tuckeroo (*Cupaniopsis anacardioides*), Celerywood (*Polyscias elegans*), Common Acronychia (*Acronychia oblongifolia*) and Coastal Banksia (Banksia integrifolia).
- *Less damaged canopy* - but where stress on plants could result in plant death in the short term, consider revegetation strategies using canopy species, such as those listed in the point above, to be planted and sit under the canopy, ready to replace existing canopy plants which may die
- *Damaged vine species*. Vines supplement the canopy cover and aid in returning structure to the rainforest. Larger vines, called lianas, such as Cockspur Thorn (*Maclura cochinchinensis*) and Water Vine (*Cissus antarctica*) are suitable.
- *Damaged mid story species* - not a high priority but generally an important food source for frugivores. Species such as, Coffee Bush (*Breynia oblongifolia*), Veiny Wilkiea (*Wilkiea huegeliana*) and Bolwarra (*Eupomatia laurina*) are suitable.
- *Damaged landward buffer* - the transition zone between the rainforest and surrounding vegetation communities but away from the direct impacts of salt laden winds. The landward buffer is likely to suffer the highest level of disturbance from the fire.

Pioneer species are a priority, followed by secondary and mature species. Include a focus on thick barked trees with a degree of natural insulation from fire, and species with the ability to recover vegetatively through coppicing, suckering and epicormic growth. Suitable secondary and mature species include: Lilly Pilly (*Syzygium smithii*), Hard Corkwood (*Endiandra sieberi*), Celerywood (*Polyscias elegans*), Corkwood (*Duboisia myoporoides*), Blackwood (*Acacia melanoxylon)*, Rusty Fig (*Ficus rubiginosa*), Sandpaper Fig (*Ficus fraserii*), Deciduous Fig (*Ficus henneana),* Ribbonwood (*Euroschinus falcatus)*, Coogera (*Arytera divaricate*) and Tuckeroo (*Cupaniopsis anacardioides*).

- *Deadwood:* Standing and fallen deadwood (also known as woody debris) plays and important role in the forest, it provides habitat for wildlife, fungi, and plant species. The fire will have burned most deadwood in the forest, but it would also have killed many trees, leaving them as standing deadwood which will eventually fall onto the forest floor. Plan to use standing and fallen deadwood as a part of your rehabilitation strategy.

Note: In the aftermath of major fire events, such as the 2019-20 east coast fires, grant funding may be available to specifically fund littoral rainforest rehabilitation. Having a rehabilitation strategy (See Attachment F: *Wallabi Point Littoral Rainforest Rehabilitation Strategy*) prepared and ready to implement will make the process of grant writing and submission easier and increase opportunities to receive funding.

Image Above: Bitou bush incursion in a cleared area surrounded by standing and fallen deadwood. Photo: Anne Rourke

Image Above: Bush regeneration in action. Buffalo grass removal in the southern section of littoral rainforest

REHABILITATION OBJECTIVES AND STRATEGY

Background

The National Recovery Plan for littoral rainforest requires the application of best practice in the rehabilitation of littoral rainforest ecosystems through:

1. plant appropriate vegetation
2. improve condition and complexity
3. restore degraded patches
4. extend existing patches
5. establish natural buffers
6. improve connectivity
7. manage and reduce threats

The best practice guidelines require a reference ecosystem, which is a model based on an appropriate local native ecosystem for the subject location. Sand dune littoral rainforest sites are more appropriate than headland littoral rainforests. It is recommended that the most suitable model sites are:

- Harrington - Crowdy Head Road just north of the Caravan Park and including isolated stands between Harrington and Crowdy Head
- Manning Point - north and south of the four-wheel drive vehicle beach access track off Manning Street, and at the rear of the Manning Point Bowling Club
- Old Bar - south of the school
- Saltwater National Park
- Diamond Beach - South end of Golden Drive

Note: Kylie's Beach Campground at Diamond Head in the Crowdy Bay National Park, can also be considered a reference ecosystem, even though it is predominantly headland littoral rainforest, as it was burnt out in the 2019 fires as well and would provide interesting recovery comparisons.

Objective

"To re-establish ecological integrity to the fire damaged littoral rainforest ecosystem by restoring natural processes and resiliency"

Strategies

- Preserve and protect surviving patches of rainforest (the green islands)
- Remove or suppress transformer, priority and environmental weeds that are limiting natural regeneration
- Repair damaged canopy and the seaward and landward edges.
- Plant appropriate species to provide wildlife stepping-stones and a genetic corridor between the Saltwater National Park and Old Bar littoral rainforests
- Improve connectivity between the south and north zones
- Coastcare to be the community custodians of the Wallabi Point littoral rainforest, with the objective to reduce threats and damage to the forest
- Apply the *Assisted Natural Regeneration* on-ground strategy

ASSISTED NATURAL REGENERATION

Different approaches to restoration are required depending on the level of damage and disturbance of the site.

- No damage, areas that did not burn, (the green islands), preserve and protect through removing threats
- Minor damage and disturbance areas benefit from minimal intervention or a 'natural regeneration' approach
- Intermediate damage and disturbance areas benefit from a combination of natural regeneration and human intervention such as revegetation, physical weed removal and the use of herbicides on serious weed infestations
- High level damage and disturbance requires a reconstruction approach (rebuilding the ecological community from scratch).

Applying what was analysed in the *Post Fire Rehabilitation Priorities*: from Step 2: *Fire Damage Overview*, and from Step 3. *Assess The Burn Spatial Impact* (Page 21), a rehabilitation strategy can be developed across the site by analysing the need to let nature heal itself (through natural regeneration) or the action required to assist rehabilitation (through assisted natural regeneration or reconstruction). Start out by identifying areas where natural regeneration can be allowed to take care of itself, then where assistance is needed in the form of weed treatment and revegetation and lastly where reconstruction is required.

That said, be aware of available resources and don't over commit. Work to the number one rule of bush regeneration, the Bradley Method: "***work from the good bush out***". This will be the areas requiring the least human intervention. It's not the lazy way out, because what you are doing is ensuring the rainforest has existing resources from which to recover, and where surviving wildlife can find refuge and foraging habitat.

Weed Removal Priorities

After fire the weed problems will be different from the time before the fire, and the problems will be evolving as the vegetation and ecosystem recover. Remember that weeds exploit disturbance to their advantage and after a fire your site could be one big disturbance.

Applying the *Post Fire Rehabilitation Priorities*: Step 5: *Weed Assessment* (Page 22), will in the weeks immediately after the fire, help in assessing the most urgent weed issues. The list below will help establish priorities for weed species and zones within the rainforest:

1. Transformer weed and Priority Weed treatment. High Priority
2. Unburnt vegetation, the islands of green, protect them, even if it means doing nothing. High Priority
3. Seaward edge. High Priority
4. Damaged canopy areas. High Priority
5. Environmental weed treatment as required. Medium Priority
6. Landward edge. Medium Priority. Note: Resource dependent, such as labour and financial resources.
7. Connectivity and natural buffers. Medium Priority. Note: Resource dependent.

The post fire response should consider how, where and when strategic weed species could be used to assist rainforest fire recovery. Consideration should also be given to the timing of weed removal, to prevent the next flowering and seed set of seasonal species, or to use herbicides during maximum growing season when translocation of the herbicide through the plants system can ensure maximum impact.

Thoroughly assessing the extent of weed issues will take over a year as the seasons change and the vegetation recovers. Keep monitoring the weed issues and stay on top of it!

If you feel you don't have the skill sets to thoroughly analyse the weed issues, ask for help, a good starting point is with Manning Coastcare, MidCoast2Tops Landcare, and MidCoast Council.

Revegetation Plantings

To assist in establishing the objectives and strategy for suitable plantings in different parts of the rainforest see *Attachment A: 'Wallabi Point Littoral Rainforest Flora and Fungi Species List'*. The list will aid plant selection based on the strategic objectives by species

Consider the plant species to be selected, generally, there are four objectives:

Population Expansion: to increase the overall size of a species population to expand foraging habitat or improve the flow of genetic material.

Reintroduction: to reintroduce a species present on site before the fire but absent afterwards.

Biodiversity Improvement: to introduce to the site species common to littoral rainforest and recorded in neighbouring stands. This action is in line with the *National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community.*

Do Not Plant: to prevent further spread of native plants not associated with the region or ecological community that may have been planted during previous rehabilitation or self-recruited from local garden seed sources.

Planting strategies vary depending on the condition of the area being rehabilitated.

Highly degraded areas, where a disturbance event has resulted in the species composition being significantly reduced, would benefit most from population expansion, reintroduction, and biodiversity improvement.

Areas of low to moderate degradation where a disturbance event has resulted in the species composition being limited or restricted, would benefit from population expansion and biodiversity improvement

Areas not burnt or where tree canopy cover is healthy, may benefit from refraining from any planting unless an overriding objective is considered necessary.

To meet the objectives of best practice in the rehabilitation of littoral rainforest, through population expansion and biodiversity improvement, the plantings should be limited to plant species which:

Priority 1: Occur on site within the Wallabi Point littoral rainforest

Priority 2: Occur within the littoral rainforest stands from Diamond Beach to Manning Point.

Timing of plantings is important to maximise plant survival. Seasonal rainfall patterns for the Mid North Coast locations, taken from the historical annual rainfall for Harrington, 20km north to northeast of Wallabi Point, (Figure 9) indicate the highest rainfall period occurs between November to June with lowest monthly rainfall occurring July to October.

Planting of juvenile plants should be conducted from late October through to late April to give plants the best opportunity to establish before the arrival of the drier winter and early spring period.

It is suggested that the plant species list for each of the suggested reference sites (Diamond Beach to Manning Point) be sourced from the *Flora and Fauna of the Mid North Coast of New South Wales,* prepared by B.M. Ralley on the Flora Great Lakes website at: http://floragreatlakes.info/html/flora.html

Figure 9: Annual Mean Monthly Rainfall for Harrington, NSW

Plant provenance, the geographic and climate location where plant propagation material is sourced, is important to ensure the best plant genetics to suit the location at which they will be planted. Fortunately, MidCoast Council nurseries at Taree and Tuncurry, source propagation material for littoral rainforest species at remnant littoral rainforests from Seal Rocks to Harrington, that are ideally suited for planting at Wallabi Point. Caution should be exercised, especially when propagating plants from within the Wallabi Point rainforest, so that a broad enough source of genetic material is sourced to prevent inbreeding.

In the core rainforest, the selection of plant species should consider two elements:

- Successional development (Page 6: *Succession*) of the rainforest through the selection of pioneer, secondary and mature plant species. See Attachment E: '*Wallabi Point Littoral Rainforest Species Planting Guide'*
- Foraging habitat with fruit bearing species across all seasons, to provide year-round food supply for insects, animals, and birds. The annual fruiting pattern of fruit bearing plants in the Wallabi Point littoral rainforest (see Attachment F: '*Wallabi Point Littoral Rainforest Seasonal Fruiting Calendar*)' indicate a lack of spring and winter fruiting species and will aid the selection of fruit bearing species.

Seaward edge revegetation should focus on salt and wind tolerant species capable of sealing the edge from the harsh elements. See Attachment E: '*Wallabi Point Littoral Rainforest Species Planting Guide'.*

Landward edge revegetation plantings can be used to develop a more fire-resistant edge by focusing on thick barked trees (e.g.: corkwoods), species that produce their own fire suppressing microclimates (e.g.: figs) as well as fruit bearing species as foraging habitat. See Attachment E: '*Wallabi Point Littoral Rainforest Species Planting Guide'* and Attachment F: '*Wallabi Point Littoral Rainforest Seasonal Fruiting Calendar'.*

Rehabilitation and regeneration are an ongoing process, as such it is important to monitor the recovery and adapt techniques and strategies where changes are necessary.

If it's not working, you're not failing. A*dapt*!

… and remember that plants die, especially in the harsh climate and oceanic conditions in which littoral rainforest occurs.

Each plant that dies is offering you a lesson about plant survival.

THE FUTURE - WHAT TO EXPECT

Fire will happen again - and Wallabi Point's littoral rainforest will burn again, we don't know when, but scientists are telling us that fires will be more frequent, more severe and the seasonality of fires is changing, fire season is starting earlier and ending later.

In November 2019, we experienced a destructive fire and our rainforest burned. We now know what happens and lessons have been learnt.

We have a blueprint to hasten recovery.

Recovery will take decades, and like the investment we make in planting a tree, the work we do to restore the ecosystem will make the rainforest better and stronger over time.

Our rehabilitation efforts, guided by the concept of succession, will make recovery happen quicker, maybe by years but hopefully by a decade or so. The rainforest will be better prepared to resist fire or any other major disturbance. The foraging and genetic corridor between Saltwater and Old Bar will be stronger and the connectivity improved.

Two years on from the fire, at the time of writing: Some trees are resprouting, some growing from seed. Canopy trees that survived the fire are flowering and fruiting. In areas where the canopy has been lost, native grasses are showing off their diversity and abundance. Wallabies, bandicoots and monitor lizards are using the forest as foraging habitat. Recovery is happening.

The neighbouring ecological communities on the seaward and landward edges of the forest have almost become post fire response monocultures of golden wattle, blady grass or Bitou Bush.

Assisted natural regeneration in the form of weed treatment, revegetation plantings and active management of the seaward and landward edges has commenced. The backyards of Wallabi Coastcarers have turned into impromptu nurseries of cuttings and seedlings and MidCoast Council's nurseries have kept up a steady stream of littoral rainforest plants.

Over the next few years as the natural regeneration picks up speed, and revegetation plantings of fast-growing pioneer species mature, we should start to see a recovery in the forest canopy and structure. Sunlight will find it harder to reach the forest floor, and the grasses will start to thin out, eventually to be reduced to one or two low light tolerant species. Some of the slower growing pioneer tree species will start to feel comfortable and start to mature. Frugivore bird species will start to return to the forest in numbers.

Ten years on from now: some of the early fast growing pioneer species will have died off to be replaced by the slower growing pioneer species and secondary species. Vine growth is noticeable. The seaward edge is well on the way to being sealed by wind sheared vegetation, and the harmful, salt laden wind has been restricted from entering the forest. The microclimate has improved and is more suitable to mature species which have started to increase in size.

Weeds are less of a problem as they can't compete against the natural regeneration and restricted sunlight. Fallen woody debris has accumulated on the forest floor, providing habitat for insects and wildlife. The decayed and rotting condition of the woody debris provides little in the way of fuel for fire. In the moist microclimate the rotting wood is supporting a suite of different fungi, insects, and beetles. The surrounding ecological communities have improved biodiversity.

Thirty years on from now: in the absence of fire (fingers crossed) - mature tree species are filling out the canopy with over 70% canopy cover and the rainforest is again a closed canopy. The increased diversity of secondary and mature tree species is providing a greater selection and abundance of flowers and fruit for pollinators and dispersers. Vine species have spread through the canopy and their stems are thick and robust. Epiphytes are loving the moist microclimate having found a home on soft barked trees.

In the north zone, the landward edge has recovered, with fire-suppressing species dominating the canopy and extending the rainforest footprint beyond the pre 2019 fire footprint. Under the closed canopy weeds are few and restricted to a handful of shade tolerant species.

To almost everyone's surprise, council has been able to resolve the legacy issue of dumping stormwater into critically endangered ecosystems and the stormwater associated weed plumes are no longer an issue. An even greater surprise is that technological advances in wastewater management resulted in MidCoast Water using spoils from urban development to back fill the redundant sewage exfiltration ponds to remediate the previously cleared areas of littoral rainforest … such technological advances were proof that the political 'magic thinking' of the early 2020's really did work.

The surrounding ecological communities will be functional ecotones between the sclerophyll and mesophyll ecological communities. Wildlife has returned and there are rumours of bunyips living in the sand dunes!

… of course, that could all change, and more frequent fires could result in the rainforest being lost. It would be nice to think that in the event of fire the littoral rainforest would have priority, but that will not happen, as human life and asset protection of the township are the highest priority. Should the day come that fire returns at least we know that bunyips hate fire and will do all they can to prevent its spread.

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ATTACHMENTS

Attachment A: ‘Wallabi Point Littoral Rainforest Flora and Fungi Species List’

Attachment B: ‘Littoral Rainforests in the MidCoast Council LGA draft report May 2019 - North Coast Aerial Mapping’

Attachment C: ‘Wallabi Point Littoral Rainforest Weed Species List’.

Attachment D: ‘Wallabi Point Littoral Rainforest Key Plant Species Fire Recover Modes’

Attachment E: ‘Wallabi Pont Littoral Rainforest Species Planting Guide’

Attachment F: ‘Wallabi Point Littoral Rainforest Seasonal Fruiting Calendar’

Attachment G: ‘Wallabi Point Littoral Rainforest Rehabilitation Strategy’

Attachment A: 'Wallabi Point Littoral Rainforest Flora and Fungi Species List'

Wallabi Point Littoral Rainforest Flora and Fungi Species List

FAMILY	Botanical Name	Common Name	Forest Layer	Site Occurrence Post Fire	Planting Objective
ANACARDIACEAE	*Euroschinus falcatus*	Ribbonwood	Canopy	Infrequent	Population Expansion
ARALIACEAE	*Polyscias elegans*	Celerywood	Canopy	Infrequent	Population Expansion
ARECACEAE	*Livistonia australis*	Cabbage tree palm	Canopy	Infrequent	
CANNABACEAE	*Aphananthe philippinensis*	Rough-leaved elm	Canopy	Did not survive fire	Reintroduction
CASUARINACEAE	*Casuarina glauca*	She oak	Canopy	Frequent	
CELASTRACEAE	*Elaneodendron australe* var. *australe*	Red olive plum	Canopy	No Observation	Biodiversity Improvement
ELAEOCARPACEAE	*Elaeocarpus obovatus*	Hard quandong	Canopy	Infrequent	Population Expansion
ELAEOCARPACEAE	*Elaeocarpus reticulatus*	Blueberry ash	Canopy	Infrequent	
FABACEAE	*Acacia melanoxylon*	Blackwood	Canopy	Infrequent	
LAURACEAE	*Cryptocarya microneura*	Murrogun	Canopy	Infrequent	Population Expansion
LAURACEAE	*Endiandra sieberi*	Hard corkwood	Canopy	No Observation	Biodiversity Improvement
MORACEAE	*Ficus coronata*	Creek sandpaper fig	Canopy	Infrequent	Gully riparian edge only
MORACEAE	*Ficus fraseri*	Sandpaper fig	Canopy	Infrequent	Population Expansion
MORACEAE	*Ficus henneana*	Deciduous fig	Canopy	Infrequent	Population Expansion
MORACEAE	*Ficus macrophylla subsp. macrophylla*	Morten Bay fig	Canopy	Infrequent	Do Not Plant
MORACEAE	*Ficus obliqua*	Small Leaf fig	Canopy	Infrequent	Population Expansion
MORACEAE	*Ficus rubiginosa*	Rusty fig	Canopy	Infrequent	Population Expansion
MYRTACEAE	*Callistemon salignus*	Willow bootlebrush	Canopy	Common	
MYRTACEAE	*Corymbia intermedia*	Pink bloodwood	Canopy	Infrequent	
MYRTACEAE	*Eucalyptus pilularis*	Blackbutt	Canopy	Infrequent	
MYRTACEAE	*Eucalyptus tereticornis*	Forest red gum	Canopy	Infrequent	
MYRTACEAE	*Melaleuca nodosa*	Prickly-leaved paperbark	Canopy	Frequent	
MYRTACEAE	*Melaleuca quinquenervia*	Broad leafed swamp paperbark	Canopy	Infrequent	
MYRTACEAE	*Melaleuca stypheliodies*	Prickly-leaved tea tree	Canopy	Infrequent	
MYRTACEAE	*Rhodomyrtus psidioides*	Native guava	Canopy	Critically Endangered	
MYRTACEAE	*Syzygium oleosum*	Blue lilly pilly	Canopy	Infrequent	Population Expansion
MYRTACEAE	*Syzygium smithii*	Lilly pilly	Canopy	Common	Population Expansion
PHYLLANTHACEAE	*Glochidion ferdinandi var. ferdinandi*	Cheese tree	Canopy	Infrequent	Population Expansion
PHYLLANTHACEAE	*Glochidion ferdinandi var. pubens*	Hairy cheese tree	Canopy	Infrequent	
PITTOSPORACEAE	*Hymenosporum flavum*	Native frangipani	Canopy	Infrequent	Do Not Plant
PITTOSPORACEAE	*Pittosporum undulatum*	Sweet pittosporum	Canopy	Infrequent	Population Expansion
PODOCARPACEAE	*Podocarpus elatus*	Plum pine	Canopy	Infrequent	Population Expansion
PROTEACEAE	*Banksia integrifolia* subsp. *integrifolia*	Coast banksia	Canopy	Very Common	Population Expansion
PROTEACEAE	*Persoonia lanceolata*	Lance leaf geebung	Canopy	Infrequent	
RHAMNACEAE	*Alphitonia excelsa*	Red ash	Canopy	Infrequent	Population Expansion
RUBIACEAE	*Cyclophyllum longipetalum*	Coast canthium	Canopy	Frequent	

Wallabi Point Littoral Rainforest Flora and Fungi Species List

FAMILY	Botanical Name	Common Name	Forest Layer	Site Occurrence Post Fire	Planting Objective
RUTACEAE	*Acronychia imperforata*	Beach acronychia	Canopy	Infrequent	
RUTACEAE	*Acronychia oblongifolia*	Common acronychia	Canopy	Infrequent	Population Expansion
RUTACEAE	*Nematolepis squamea*	Satinwood	Canopy	Frequent	
SAPINDACEAE	*Alectryon coriaceus*	Beach bird's eye	Canopy	Very Common	Population Expansion
SAPINDACEAE	*Arytera divaricata*	Coogera	Canopy	Infrequent	Population Expansion
SAPINDACEAE	*Cupaniopsis anacardioides*	Tuckeroo	Canopy	Very Common	
SAPINDACEAE	*Guioa semiglauca*	Guioa	Canopy	Very Common	
SOLANACEAE	*Duboisia myoporoides*	Corkwood	Canopy	Frequent	
APOCYNACEAE	*Parsonsia straminea*	Monkey rope	Climber	Infrequent	
ASPHODELACEAE	*Geitonoplesium cymosum*	Scrambling lily	Climber	Frequent	
BIGNONIACEAE	*Pandorea pandorana*	Wonga wonga vine	Climber	Frequent	
CUCURBITACEAE	*Diplocyclos palmatus*	Native bryony	Climber	Common	
DILLENIACEAE	*Hibbertia dentata*	Twining guinea flower	Climber	Infrequent	
DILLENIACEAE	*Hibbertia scandens*	Climbing guinea flower	Climber	Frequent	Population Expansion
MENISPERMACEAE	*Sarcopetalum harveyanum*	Pearl vine	Climber	Common	
MENISPERMACEAE	*Stephania japonica*	Snake vine	Climber	Common	
MORACEAE	*Maclura cochinchinensis*	Cockspur thorn	Climber	Frequent	
PASSIFLORACEAE	*Passiflora herbertiana*	Native passionfruit	Climber	Infrequent	Population Expansion
PITTOSPORACEAE	*Billardiera scandens*	Apple berry	Climber	Frequent	
RANUNCULACEAE	*Clematis glycinoides*	Old man's beard	Climber	Infrequent	
SMILACACEAE	*Eustrephus latifolius*	Wombat berry	Climber	Frequent	
SMILACACEAE	*Smilax australis*	Lawyer vine	Climber	Infrequent	
VITACEAE	*Cayratia clematidea*	Native grape	Climber	Frequent	
VITACEAE	*Cissus antarctica*	Water vine	Climber	Infrequent	Population Expansion
ASPLENIACEAE	*Asplenium australasicum*	Birds-nest fern	Epiphyte	Infrequent	
POLYPODIACEAE	*Platycerium bifurcatum*	Elkhorn fern	Epiphyte	Infrequent	
POLYPODIACEAE	*Pyrrosia rupestris*	Rock felt fern	Epiphyte	Infrequent	
LORANTHACEAE	*Muellerina celastroides*	Coast mistletoe	Mistletoe	Infrequent	
AMARYLLIDACEAE	*Crinum pedunculatum*	Swamp lily	Under Story	Infrequent	Population Expansion
ARALIACEAE	*Polyscias sambucifolia*	Elderberry panax	Under Story	Infrequent	
ASPARAGACEAE	*Cordyline stricta*	Narrow leaved palm lily	Under Story	Infrequent	Population Expansion
ASTERACEAE	*Ozothamnus diosmifolius*	White dogwood	Under Story	Infrequent	
CANNABACEAE	*Trema tomentosa* var. *aspera*	Native peach	Under Story	Common	
CYATHEACEAE	*Cyathea australis*	Rough tree fern	Under Story	Infrequent	
EUPHORBIACEAE	*Homalanthus populifolius*	Bleeding heart	Under Story	Frequent	
EUPOMATICEAE	*Eupomatia laurina*	Bolwarra	Under Story	No Observation	Biodiversity Improvement
FABACEAE	*Acacia longifolia*	Sydney golden wattle	Under Story	Common	

Wallabi Point Littoral Rainforest Flora and Fungi Species List

FAMILY	Botanical Name	Common Name	Forest Layer	Site Occurrence Post Fire	Planting Objective
FABACEAE	*Acacia longifolia* subsp. *sophorae*	Coastal wattle	Under Story	Common	
LAMIACEAE	*Clerodendrum tomentosum*	Hairy clerodendrum	Under Story	Frequent	
MALAVACEAE	*Hibiscus heterophyllus*	Native rosella	Under Story	Infrequent	Population Expansion
MELIACEAE	*Synoum glandulosum*	Scentless rosewood	Under Story	No Observation	Biodiversity Improvement
MONIMIACEAE	*Wilkiea huegeliana*	Veiny wilkiea	Under Story	No Observation	Biodiversity Improvement
OLEACEAE	*Notelaea longifolia*	Mock olive	Under Story	Frequent	Population Expansion
PHYLLANTHACEAE	*Breynia oblongifolia*	Coffee bush	Under Story	Common	
PITTOSPORACEAE	*Pittosporum multiflorum*	Orange thorn	Under Story	Infrequent	Population Expansion
PITTOSPORACEAE	*Pittosporum revolutum*	Yellow pittosporum	Under Story	Frequent	Population Expansion
PRIMULACEAE	*Myrsine variabilis*	Variable leaf muttonwood	Under Story	Frequent	
PROTEACEAE	*Banksia aemula*	Wallum banksia	Under Story	Infrequent	
SAPINDACEAE	*Dodonaea triquetra*	Hop bush	Under Story	Infrequent	
SCROPHULARIACEAE	*Myoporum boninense* subsp. *australe*	Coastal boobialla	Under Story	Frequent	Population Expansion
SOLANACEAE	*Solanum aviculare*	Kangaroo apple	Under Story	Infrequent	
THYMELAEACEAE	*Wikstroemia indica*	Bootlace bush	Under Story	Frequent	
ZINGIBERACEAE	*Alpinia caerulea*	Native ginger	Under Story	Infrequent	Population Expansion
ACANTHACEAE	*Pseuderanthemum variabile*	Pastel flower	Forest Floor	Frequent	
AIZOACEAE	*Tetragonia tetragonioides*	Warrigal greens	Forest Floor	Infrequent	
ARACEAE	*Gymnostachys anceps*	Settler's flax	Forest Floor	Frequent	
ARALIACEAE	*Hydrocotyle sibthorpioides*	Native hydrocotyle	Forest Floor	Frequent	
ASPARAGACEAE	*Lomandra longifolia*	Spiny mat rush	Forest Floor	Very Common	
ASPARAGACEAE	*Lomandra sp* aff. *longifolia*	Coastal spiny mat rush	Forest Floor	Very Common	
ASPHODELACEAE	*Dianella caerulea* var. *producta*	Flax lily	Forest Floor	Common	
ASPHODELACEAE	*Dianella caerulea var. caerulea*	Paroo lily	Forest Floor	Common	
ASPHODELACEAE	*Xanthorrhoea sp. (latifolia or macronema?)*	Grass tree	Forest Floor	Infrequent	
ASTERACEAE	*Sigesbeckia orientalis*	Indian weed	Forest Floor	Infrequent	
BLECHNACEAE	*Doodia aspera*	Rasp fern	Forest Floor	Common	
CAMPANULACEAE	*Lobelia purpurascens*	White root	Forest Floor	Frequent	
CHENOPODIACEAE	*Rhagodia candolleana*	Sea berry saltbush	Forest Floor	Frequent	
COMMELINACEAE	*Commelina cyanea*	Scurvy weed	Forest Floor	Common	
CONVOLULACEAE	*Dichondra repens*	Kidney weed	Forest Floor	Common	
CYPERACEAE	*Cyperus gracilis*	Unnamed sedge	Forest Floor	Frequent	
CYPERACEAE	*Ficinia nodosa*	Knobby club rush	Forest Floor	Infrequent	
CYPERACEAE	*Gahnia aspera*	Rough saw sedge	Forest Floor	Frequent	
CYPERACEAE	*Gahnia melanocarpa*	Black fruit saw sedge	Forest Floor	Infrequent	
CYPERACEAE	*Gahnia sieberana*	Red-fruited saw-sedge	Forest Floor	Infrequent	
DENNSIACEAETAEDT	*Pteridium esculentum*	Common bracken fern	Forest Floor	Infrequent	

Wallabi Point Littoral Rainforest Flora and Fungi Species List

FAMILY	Botanical Name	Common Name	Forest Layer	Site Occurrence Post Fire	Planting Objective
DICKSONIACEAE	*Calochlaena dubia*	Common ground fern	Forest Floor	Infrequent	
FABACEAE	*Desmodium varians*	Slender trick-trefoil	Forest Floor	Infrequent	
FABACEAE	*Glycine clandestina*	Twining glycine	Forest Floor	Infrequent	
ORCHIDACEAE	*Acianthus fornicatus*	Pixie Caps	Forest Floor	Infrequent	
ORCHIDACEAE	*Caladenia catenata*	White caladenia	Forest Floor	Infrequent	
ORCHIDACEAE	*Pterostylis alveata*	Coastal greenhood orchid	Forest Floor	Infrequent	
OXALIDACEAE	*Oxalis rubens*	Wood sorrel	Forest Floor	Infrequent	
POACEAE	*Cynodon dactylon*	Common couch	Forest Floor	Frequent	
POACEAE	*Echinopogon caespitosus* var. *caespitosus*	Hedgehog grass	Forest Floor	Infrequent	
POACEAE	*Entolasia marginata*	Right angle grass	Forest Floor	Common	
POACEAE	*Entolasia stricta*	Wiry panic grass	Forest Floor	Infrequent	
POACEAE	*Imperata cylindrica*	Blady grass	Forest Floor	Very Common	
POACEAE	*Microlaena stipoides*	Weeping meadow grass	Forest Floor	Frequent	
POACEAE	*Oplismenus imbecillis*	Creeping beard grass	Forest Floor	Very Common	
POACEAE	*Zoysia macrantha*	Coast couch	Forest Floor	Frequent	
PTERIDACEAE	*Pellaea falcata*	Sickle fern	Forest Floor	Frequent	
RIBIACEAE	*Pomax Umbellata*	Pomax	Forest Floor	Infrequent	
ROSACEAE	*Rubus parvifolius*	Native raspberry	Forest Floor	Infrequent	
SOLANACEAE	*Solanum prinophyllum*	Forest nightshade	Forest Floor	Infrequent	
VIOLACEAE	*Viola Banksii*	Bank's violet	Forest Floor	Frequent	
BASIDIOMYCOTA	*Laetiporus portentosus*	White punk fungus	Fungi	Infrequent	
CLAVARIACEAE	*Clavaria fragilis*	Fairy fingers fungus	Fungi	Infrequent	
GANDODERMSTACEAE	*Ganoderma australe*	Artist's fungus	Fungi	Infrequent	
HYPOXYLACEAE	*Daldinia concentrica*	King Alfred's cakes/Coal fungus	Fungi	Infrequent	
MARASMIACEAE	*Omphalotus nidiformis*	Ghost fungus	Fungi	Infrequent	
MYXOMYCOTA	*Fuligo septica*	Dog vomit fungus	Fungi	Infrequent	
POLYPORACEAE	*Pycnoporus coccineus*	Scarlet bracket fungus	Fungi	Infrequent	

Group 5: Tuckeroo - Coast Banksia - Yellow Tulip - Mock Olive Littoral Rainforest

Scientific Name: Cupaniopsis anacardioides – Banksia integrifolia – Drypetes deplanchei – Notelaea longifolia

Structure: Dwarf to tall simple notophyll-microphyll closed forest varying in height from 1m to 18m.

Floristic Description: Overstorey typically dominated by Cupaniopsis anacardioides (Tuckeroo) with Banksia integrifolia subsp. integrifolia (Coast Banksia) either emergent or an overstorey associate species. Other overstorey co-dominant to associate species include Drypetes deplanchei (Yellow Tulipwood), Notelaea longifolia (Mock Olive), Planchonella australis (Black Apple), Alectryon coriaceus (Beach Alectryon), Acmena smithii (Lilly Pilly), Acronychia wilcoxiana (Silver Aspen), Euroschinus falcatus (Ribbonwood), Acronychia imperforata (Beach Acronychia) and Sarcomelicope simplicifolia (Yellow Aspen). Ficus rubiginosa (Rusty Fig) is a common emergent, with other rarely recorded figs including F. fraseri (Sandpaper Fig), F. obliqua (Small-leaved Fig) and F. henneana (Deciduous Fig). The mid-stratum is usually sparse but can be moderately dense, with commonly recorded small trees or shrubs including the above-listed canopy species along with Myrsine variabilis (Muttonwood), Wilkiea huegeliana (Veiny Wilkiea), Guioa semiglauca (Guioa), Polyscias elegans (Celerywood), Pittosporum revolutum (Rough-fruit Pittosporum) and Cyclophyllum longipetalum (Coast Canthium). The understorey is usually very sparse, with commonly recorded species including Oplismenus imbecillis (Creeping Beard Grass), Lomandra longifolia (Spiny-headed Mat-rush), Commelina cyanea (Scurvy Weed), Pellaea falcata (Sickle Fern), Cyperus eglobosus, Dianella caerulea (Blue Flax Lily) and Viola banksii (Wild Violet). Vines are common, and include Smilax australis (Lawyer Vine), Cissus antarctica (Water Vine), Sarcopetalum harveyanum (Pearl Vine), Stephania japonica var. discolor (Snake Vine), Maclura cochinchinensis (Cockspur Vine), Geitonoplesium cymosum (Scrambling Lily), Hibbertia scandens (Climbing Guinea Flower) and Pandorea pandorana (Wonga Vine).

Area mapped in MC LGA: 126 ha (20% of mapped littoral rainforest).

Habitat and Distribution: Within the study area this community occurs along the length of the coastline on foredune systems behind sandy beaches on Holocene dunes, beach ridges and associated sandplains, as well as on Pleistocene dunes, beach ridges and sandplains and, in several places, on bedrock-mantling dunes. Mapped at Kylies Beach to Crowdy Gap (Crowdy Bay NP); between Crowdy Head and Harrington; Manning Point to Mitchells Island; Old Bar to Wallabi Point (Saltwater NP); Diamond Beach, Black Head Beach, Black Head back beach; Forster-Tuncurry; Tiona, Elizabeth Beach, Shelly Beach (Booti Booti NP); Blueys Beach, Cellito; Seal Rocks, Treachery Head, Yagon Gibber, Broken Sands (Myall Lakes NP); Yacaaba Peninsula.

Variation: Stands of this community on exposed sites are low, dense, wind-pruned thickets which usually form a mosaic with Banksia integrifolia, Leptospermum laevigatum and Acacia sophorae sclerophyll shrublands, e.g., Crowdy Gap, Blueys Beach, Lighthouse Beach. Stands in sheltered sites are taller and more diverse, being protected from salt-laden breezes by tall dunes or Banksia integrifolia tall shrubland or forest. This community often forms a band of variable width on the exposed seaward side of Coogera - Yellow Tulip - Native Celtis - Myrtle Ebony Littoral Rainforest (Group 2). Some examples of this community, e.g., behind Black Head Beach, are dominated by species such as Cryptocarya glaucescens (Jackwood), Endiandra sieberi (Hard Corkwood) and Acacia maidenii (Sally Wattle). These stands are probably regenerating after previously being cleared (W. Chapman, pers. comm. August 2018). Bell & Driscoll (2005) describe littoral rainforests from Treachery Head on dunes with an open overstorey (25 – 30% cover) of Eucalyptus pilularis (Blackbutt). This type was observed during the present study in sheltered dunes at nearby Yagon Gibber. It is included within this community, based on floristic analysis, but warrants further investigation. Leptospermum laevigatum (Coast Tea Tree) commonly occurs in disturbed examples of this community, especially where it was planted as a post-sandmining dune stabiliser. Similarly, Imperata cylindrica (Blady Grass) can be abundant in the understorey in disturbed remnants where canopy gaps persist.

Attachment C: 'Wallabi Point Littoral Rainforest Weed Species List'.

WALLABI POINT LITTORAL RAINFOREST - WEED SPECIES LIST

Table Key: **Priority** - L: Low.
M: Medium
H: High

Status - T: Transformer Weed
C1: Controlled. Objective: Asset Protection (minimise spread)
C2: Controlled. Objective: Containment
E: Environmental Weed
A: Annual Weed

Common Name	Botanical Name	Priority	Status					Treatment
			T	C1	C2	E	A	
Asparagus, Climbing	*Asparagus plumosa*	M		◆				Crown out.
Asparagus, Ground	*Asparagus aethiopicus*	H	◆	◆				Crown out. Foliar spray with Glyphosate 20ml per litre plus Metsolfuron 1gm (quarter teaspoon) per 10 litres plus non-ionic surfactant.
Beach Gladiolus	*Gladiolus gueinzii*	M				◆	◆	Grub out. Remove exsitu all bulbs.
Billygoat Weed	*Ageratum conyzoides*	H				◆	◆	Hand pull juveniles from base. Cut and paint adults with neat herbicide. Prevent from setting seed.
Bitou Bush		H	◆		◆			Hand pull juveniles. Scrape or cut and paint larger plants. Sprayed by contractors.
Bird of Paradise	*Strelitzia spp.*	M				◆		Grub out. Cut and paint with 100% Glyphosate
Blackberry Nightshade	*Solanum nigrum*	M				◆	◆	Hand pull or grub out.
Brazilian Nightshade	*Solanum seaforthianum*	M				◆		Treat before flowering every year. Hand pull smaller plants. Skirt larger plants. Scrape and paint 40 to 60cm of trunk with 100% Glyphosate or for smaller plants foliar spray with 1/100 Glyphosate
Broadleaf Paspalum	*Paspalum mandiocanum*	M				◆		Crown out/ Spot spray 1/100 Glyphosate
Buffalo Grass	*Stenotaphrum secundatum*	H	◆					Grub out. Spot spray 1/100 Glyphosate
Cape Gooseberry	*Physalis peruviana*	L				◆	◆	Hand pull before seed set
Coastal Gazania	*Gazania rigens*	L				◆		Glyphosate resistant. Grub out, turn roots upwards and leave insitu
Coastal Morning Glory	*Ipomoea cairica*	H	◆					Hand remove runners, twine up and hang in foliage - do not leave on ground. Larger runners trace back to rooting nodes and scrape and paint with 100% Glyphosate

WALLABI POINT LITTORAL RAINFOREST - WEED SPECIES LIST

Table Key: **Priority** - L: Low.
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E: Environmental Weed
A: Annual Weed

Common Name	Botanical Name	Priority	Status					Treatment
			T	C1	C2	E	A	
Coral Tree	*Erythrina crista-galli*	M				◆		Drill/Frill 100% Glyphosate. Deciduous. New growth in spring. Treat before seed set in November
Creeping Groundsel	*Senecio angulatus*	M				◆		Hand pull or grub out juveniles. Larger plants foliar spray with 10ml Glyphosate per litre.
Crofton Weed	*Ageratina adenophora*	H				◆	◆	Hand pull juveniles from base. Cut (skirt) and paint adults with neat herbicide. Prevent from setting seed.
Farmers Friends / Cobblers Pegs/ Bidens	*Bidens pilosa*	M				◆		Cut back before flowering. Leave green waste in situ to suppress regrowth.
Fireweed	*Senecio madagascariensis*	H		◆			◆	Hand pull. Repeat Treatment. Persistence and patience.
Fruit Salad Plant	*Monstera deliciosa*	L				◆		Cut and paint stump. Remove rooting section off site.
Gladiolus	*Gladiolus sp.*	M				◆		Hand remove bulbs and check for pup bulbs
Glory Lily	*Gloriosa superba*	H	◆		◆		◆	Annual plant that dies off over winter and resprouts in spring. Small plants can be cut out - be careful and remove all rhizomes. Larger plants stem scrape and paint with 100% glyphosate or folia spray with Glyphosate 20ml and Metsolfuron 1.5gm (third teaspoon) per litre plus non-ionic surfactant.
Giant Pidgeon Grass	*Setaria spp.*	H				◆		Crown out. Treat before seed set.
Inkweed	*Phytolacca octandra*	H				◆	◆	Small plants grub or crown out. Larger plants spray 1:100 Glyphosate. Commence treatment October/November
Kaffir Plum	*Harpephyllum caffrum*	L				◆		Cut and paint 100% Glyphosate
Kikuyu Grass	*Pennisetum clandestinum*	H	◆					Grub out roots. Raft green waste in-situ. Follow up.
Kurnell Curse / Hydrocotyle	*Hydrocotyle bonariensis*	L				◆		An exercise in futility for volunteers. If treatment is required should be done by contractors.
Lantana	*Lantana camara*	H	◆	◆				Hand pull juveniles. Cut and paint larger plants.
Liriope	*Liriope sp.*	L				◆		paint with 100% Glyphosate

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Common Name	Botanical Name	Priority	Status					Treatment
			T	C1	C2	E	A	
Madeira Vine	*Anredera cordifolia*	H	◆	◆				DO NOT cut & paint. DO NOT remove tubers from plant except where scraping. Scrape one side only of lower stem near ground 20cm+ and apply 100% Glyphosate. Repeat about 1 metre up stem. Leave plant alone while vine and tubers desiccate. May take up to a year.
Mickey Mouse Plant / Ochna	*Ochna serrulata*	H				◆		DO NOT hand pull as plant will snap and resprout. Strip branches from lower part of trunk, expose upper root area. Scrape and paint exposed root and trunk with 100% Glyphosate then cut trunk above scrapped area and paint stump with 100% Glyphosate. Follow up required in case it resprouts. GOOD LUCK!
Mother of Millions	*Bryophyllum spp.*	H				◆		Hand pull and bag plants to ex-situ disposal. Also collect organic matter from around base of plant and dispose ex-situ as well. PERSISTENCE is required.
Moth Vine	*Araujia sericifera*	M				◆		Hand pull juveniles. Larger plants skirt vine and scrape and paint lower stem. Do before plant sets fruit.
Noogoora Burr		H				◆	◆	Hand pull as soon as possible before seed set. Seed sets at a young age
Paddy's Lucerne	*Sida rhombifolia*	L				◆		Hand pull smaller plants. Larger plants cut and paint with 100% Glyphosate
Passionfruit, Rootstock	*Passiflora caerulea*	H				◆		Do not hand pull as plant will snap and resprout. Larger plants can be skirted and the lower stem treated with 100% glyphosate by cut and scrape and paint. Smaller plants can be sprayed Glyphosate 1:50 or if roots exposed scrape paint 100% Glyphosate

WALLABI POINT LITTORAL RAINFOREST - WEED SPECIES LIST

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Common Name	Botanical Name	Priority	Status					Treatment
			T	C1	C2	E	A	
Passionfruit, White	*Passiflora subpeltata*	H				◆		Check for glands on petiole. Check to make sure not Native Bryony (red cucumber). If no, then hand pull. Larger plants can be skirted and lower stem scrape and paint 100% Glyphosate
Prickly Pear	*Opuntia spp.*	H		◆				If possible, physically remove small plants and dispose ex situ. Larger plants spray with 2gms/10L of Metsolfuron (half teaspoon/10L)
Rhodes Grass	*Chloris gayana*	H				◆		Crown Out. Treat before flowering
Sea Rocket	*Cakile edentula*	L				◆		Opinion varies as to whether this is a weed or not. Grub out.
Winter Senna	*Senna pendula*	H	◆					Can be difficult to kill mature plants. Juveniles can be hand pulled by grasping base of stem and increasing pressure - if it feels like it will break stop and treat as follows. Larger plants cut and paint trunk around 40cm from ground then scrape and paint trunk with 100% Glyphosate.
Sharp Rush	*Juncus acutus*	H				◆		Not suitable for volunteers to touch. WHS issues. Refer to council for control.
Stinking Roger	*Tagetes minuta*	H				◆	◆	Hand pull
Wild Tobacco	*Solanum mauritianum*	M				◆		Hand pull smaller plants. Larger plants cut and paint with 100% Glyphosate

Attachment D: 'Wallabi Point Littoral Rainforest Key Plant Species Fire Recover Modes'

Wallabi Point Littoral Rainforest - Key Plant Species Fire Recovery Modes

Botanical Name	Common Name	Fire Recovery Mode					
		Coppice (Resprout Base)	Epicormic Growth (Resprout Trunk or Branch)	Suckering (Resprout Roots)	Seed (In Situ) Seedbank	Seed (Ex Situ) Offsite	Likely Killed (Obligate Seeder)
Acacia melanoxylon	Blackwood			●	●		
Acronychia oblongifolia	Common acronychia	●		●		●	
Alectryon coriaceus	Beach bird's eye	●			●	●	
Alphitonia excelsa	Red ash	●			●	●	
Alpinia caerulea	Native ginger	●				●	
Androcalva fraseri	Brush kurrajong			●			
Banksia integrifolia	Coastal banksia				●		●
Breynia oblongifolia	Coffee bush	●			●	●	
Cupaniopsis anacardioides	Tuckeroo	●			●	●	
Dianella caerulea var. producta	Flax lily		●			●	
Duboisia myoporoides	Corkwood	●			●	●	
Doodia aspera	Rasp fern		●				
Elaeocarpus obovatus	Hard quandong	●			●	●	
Gahnia spp.	Gahnia		●		●		
Glochidion ferdinandi	Cheese tree	●			●		
Guoia semiglauca	Guoia	●					
Hibiscus heterophyllus	Native rosella				●		●
Hibbertia scandens	Twinning guinea flower				●	●	
Homalanthus populifolius	Bleeding heart				●	●	●

Wallabi Point Littoral Rainforest - Key Plant Species Fire Recovery Modes

Botanical Name	Common Name	Fire Recovery Mode					
		Coppice (Resprout Base)	Epicormic Growth (Resprout Trunk or Branch)	Suckering (Resprout Roots)	Seed (In Situ) Seedbank	Seed (Ex Situ) Offsite	Likely Killed (Obligate Seeder)
Leptospermum laevigatum	Coastal tea tree				●		●
Lomandra longifolia	Mat rush		●		●		
Maclura cochinchinensis	Cockspur thorn	●		●		●	
Oplismenus imbecillis	Creeping beard grass				●		
Pittosporum undulatum	Mock orange				●	●	●
Smilax australis	Lawyer vine				●		
Stephania japonica var. discolor	Snake vine				●	●	
Syzygium smithii	Lilly pilly	●			●	●	

Wallabi Point Littoral Rainforest - Species Planting Guide

Table Key: **Salt Tolerance - L**: Low. **M**: Medium. **H**: High. **VH**: Very High | **Growth Rate** - **S**: Slow. **M**: Moderate. **F**: Fast

Wind Tolerance - L: Low. **M**: Medium. **H**: High. **VH**: Very High | **Successional Stage - P**: Pioneer. **S**: Secondary. **M**: Mature

Botanical Name	Common Name	Littoral Rainforest Location			Salt Tolerance	Wind Tolerance	Growth Rate	Size	Succession Stage
		Seaward Edge	Core Rainforest	Landward Edge					
Acacia sophorae	Coastal wattle	◆			VH	VH	F	< 5 m	P
Acacia melanoxylon	Blackwood		◆	◆	M	H	F	10-25 m	P
Acronychia oblongifolia	Common acronychia		◆		M	H	M	5-10 m	S
Alectryon coriaceus	Beach bird's eye	◆	◆		VH	H	M	5-10 m	S
Alphitonia excelsa	Red ash		◆	◆	M	H	F	10-25 m	P
Androcalva fraseri	Brush kurrajong		◆	◆	H	M	F	5-10 m	P
Arytera divaricata	Coogera		◆	◆	M	L	S	10-25 m	M
Banksia integrifolia	Coastal banksia	◆	◆	◆	VH	VH	F	10-25 m	S
Breynia oblongifolia	Coffee bush		◆	◆	M	H	M	< 5 m	P
Casuarina glauca	She oak	◆			VH	H	M	10-25 m	P
Cissus antarctica	Water vine	◆	◆	◆	H	H	F	Climber	S
Claoxylon australe	Brittlewood		◆	◆	L	L	M	5-10 m	M
Clerodendrum tomentosum	Hairy clerodendrum		◆	◆	M	M	M	5-10 m	P
Cordyline stricta	Narrow leaved palm lily		◆	◆	L	L	M	< 5 M	S
Cupaniopsis anacardioides	Tuckeroo	◆	◆	◆	VH	H	M	10-25 m	S
Cyclophyllum longipetalum	Coast canthium		◆		M	L	M	5-10 m	M
Duboisia myoporoides	Corkwood		◆	◆	M	M	F	5-10 m	P

Wallabi Point Littoral Rainforest - Species Planting Guide

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Wind Tolerance - L: Low. **M**: Medium. **H**: High. **VH**: Very High

Growth Rate - **S**: Slow. **M**: Moderate. **F**: Fast

Successional Stage - P: Pioneer. **S**: Secondary. **M**: Mature

Botanical Name	Common Name	Littoral Rainforest Location			Salt Tolerance	Wind Tolerance	Growth Rate	Size	Succession Stage
		Seaward Edge	Core Rainforest	Landward Edge					
Elaeocarpus obovatus	Hard quandong		◆		M	H	M	10-25 m	M
Elaeodendron australe	Red olive plum		◆		M	M	S	5-10 m	M
Endiandra sieberi	Hard corkwood		◆	◆	M	M	S	10-25 m	M
Eupomatia laurina	Bolwarra		◆	◆	L	L	S	< 5 m	S
Ficus fraseri	Sandpaper fig		◆		M	M	M	10-25 m	M
Ficus macrophylla	Moreton Bay fig	◆	◆	◆	H	H	S	> 25 m	M
Ficus obliqua	Small leaf fig	◆	◆	◆	H	H	S	> 25 m	M
Ficus rubiginosa	Rusty fig	◆	◆	◆	H	H	S	10-25 m	M
Glochidion ferdinandi	Cheese tree		◆		M	M	M	10-25 m	P
Guioa semiglauca	Guioa		◆	◆	H	M	M	5-10 m	S
Hibiscus heterophyllus	Native rosella		◆	◆	M	M	F	5-10 m	P
Homalanthus populifolius	Bleeding heart		◆		L	L	F	5-10 m	P
Livistona australis	Cabbage tree palm		◆		M	M	S	10-25 m	M
Maclura cochinchinensis	Cockspur thorn		◆	◆	H	M	M	Climber	S
Myoporum boninense	Coastal boobialla	◆			VH	VH	F	< 5 m	P
Myrsine howittiana	Muttonwood		◆		L	M	M	5-10 m	S
Myrsine variabilis	Variable leaf muttonwood		◆		L	M	S	5-10 m	S
Nematolepis squamea	Satinwood		◆	◆	M	M	M	5-10 m	S

Wallabi Point Littoral Rainforest - Species Planting Guide

Table Key: **Salt Tolerance - L**: Low. **M**: Medium. **H**: High. **VH**: Very High

Wind Tolerance - L: Low. **M**: Medium. **H**: High. **VH**: Very High

Growth Rate - **S**: Slow. **M**: Moderate. **F**: Fast

Successional Stage - P: Pioneer. **S**: Secondary. **M**: Mature

Botanical Name	Common Name	Littoral Rainforest Location			Salt Tolerance	Wind Tolerance	Growth Rate	Size	Succession Stage
		Seaward Edge	Core Rainforest	Landward Edge					
Notelaea longifolia	Mock olive		◆		M	M	S	< 5 m	S
Pandorea pandorana	Wonga wonga vine		◆		L	L	F	Climber	P
Parsonsia straminea	Monkey rope		◆		M	M	F	Climber	P
Passiflora herbertiana	Native passionfruit		◆		L	L	F	Climber	P
Pittosporum multiflorum	Orange thorn		◆		M	L	S	< 5 m	S
Pittosporum revolutum	Yellow pittosporum		◆	◆	M	M	S	5 m	S
Pittosporum undulatum	Mock orange		◆		M	H	M	5-10 m	P
Planchonella australis	Black apple		◆	◆	L	L	S	10-25 m	M
Podocarpus elatus	Plum pine		◆	◆	M	H	S	20-25 m	M
Polyscias elegans	Celerywood		◆	◆	M	M	F	20-25 m	P
Sarcomelicope simplicifolia	Yellow wood		◆	◆	M	M	M	10-25 m	M
Sarcopetalum harveyanum	Pearl vine		◆	◆	M	L	M	Climber	P
Scolopia braunii	Flintwood		◆	◆	L	L	S	5-10 m	M
Smilax australis	Lawyer vine	◆	◆	◆	H	H	F	Climber	P
Solanum aviculare	Kangaroo apple		◆	◆	L	L	F	< 5 m	P
Stephania japonica	Snake vine		◆	◆	L	L	F	Climber	P
Synoum glandulosum	Scentless rosewood		◆	◆	L	M	M	5-10 m	S
Syzygium oleosum	Blue lilly pilly		◆		M	M	M	5-10 m	M

Wallabi Point Littoral Rainforest - Species Planting Guide

Table Key: **Salt Tolerance - L**: Low. **M**: Medium. **H**: High. **VH**: Very High

Wind Tolerance - L: Low. **M**: Medium. **H**: High. **VH**: Very High

Growth Rate - **S**: Slow. **M**: Moderate. **F**: Fast

Successional Stage - P: Pioneer. **S**: Secondary. **M**: Mature

Botanical Name	Common Name	Littoral Rainforest Location			Salt Tolerance	Wind Tolerance	Growth Rate	Size	Succession Stage
		Seaward Edge	Core Rainforest	Landward Edge					
Syzygium smithii	Lilly pilly	◆	◆	◆	H	H	M	5-10 m	M
Trema tomentosa	Native peach		◆	◆	M	M	F	< 5 m	P
Wilkiea huegeliana	Veiny wilkiea		◆		M	L	S	< 5 m	S

Attachment F: 'Wallabi Point Littoral Rainforest Seasonal Fruiting Calendar'

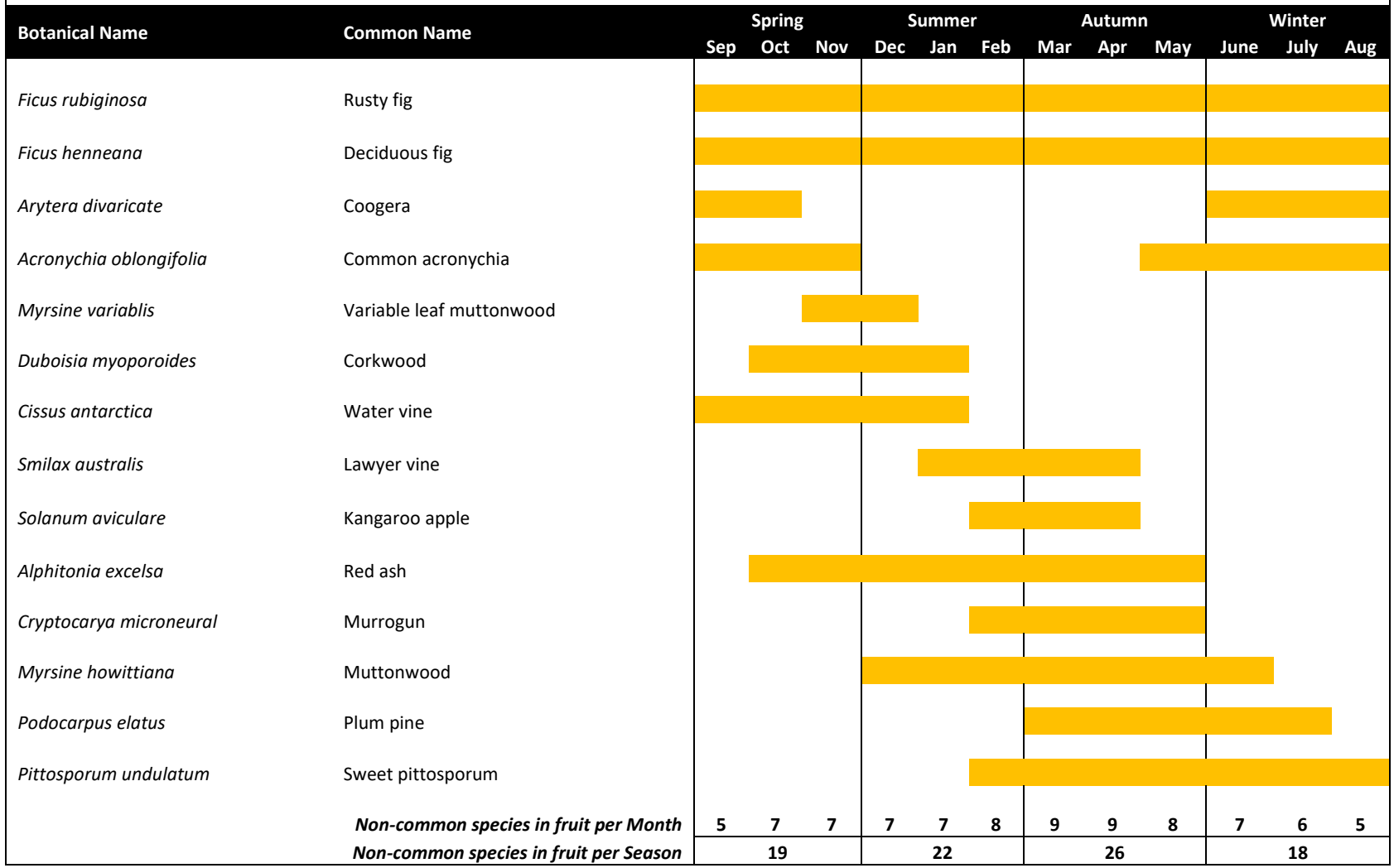
WALLABI POINT LITTORAL RAINFOREST SEASONAL FRUITING CALENDAR
COMMON SPECIES

Botanical Name	Common Name	Spring			Summer			Autumn			Winter		
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Cupaniopsis anacardioides	Tuckeroo												
Cyclophyllum longipetalum	Coast canthium												
Pittosporum revolutum	Yellow pittosporum												
Homalanthus populifolius	Bleeding heart												
Notelaea longifolia	Mock olive												
Maclura cochinchinensis	Cockspur thorn												
Elaeocarpus obovatus	Hard quandong												
Breynia oblongifolia	Coffee bush												
Guioa semiglauca	Guoia												
Clerodendrum tomentosum	Hairy clerodendrum												
Trema tomentosa	Native peach												
Alectryon coriaceus	Beach bird's eye												
Syzygium smithii	Lilly pilly												
	Common species in fruit per Month	**0**	**2**	**3**	**6**	**8**	**8**	**9**	**8**	**6**	**2**	**2**	**1**
	Common species in fruit per Season		**5**			**22**			**23**			**5**	

Common species have large populations sizes on site.

WALLABI POINT LITTORAL RAINFOREST SEASONAL FRUITING CALENDAR

NON-COMMON SPECIES

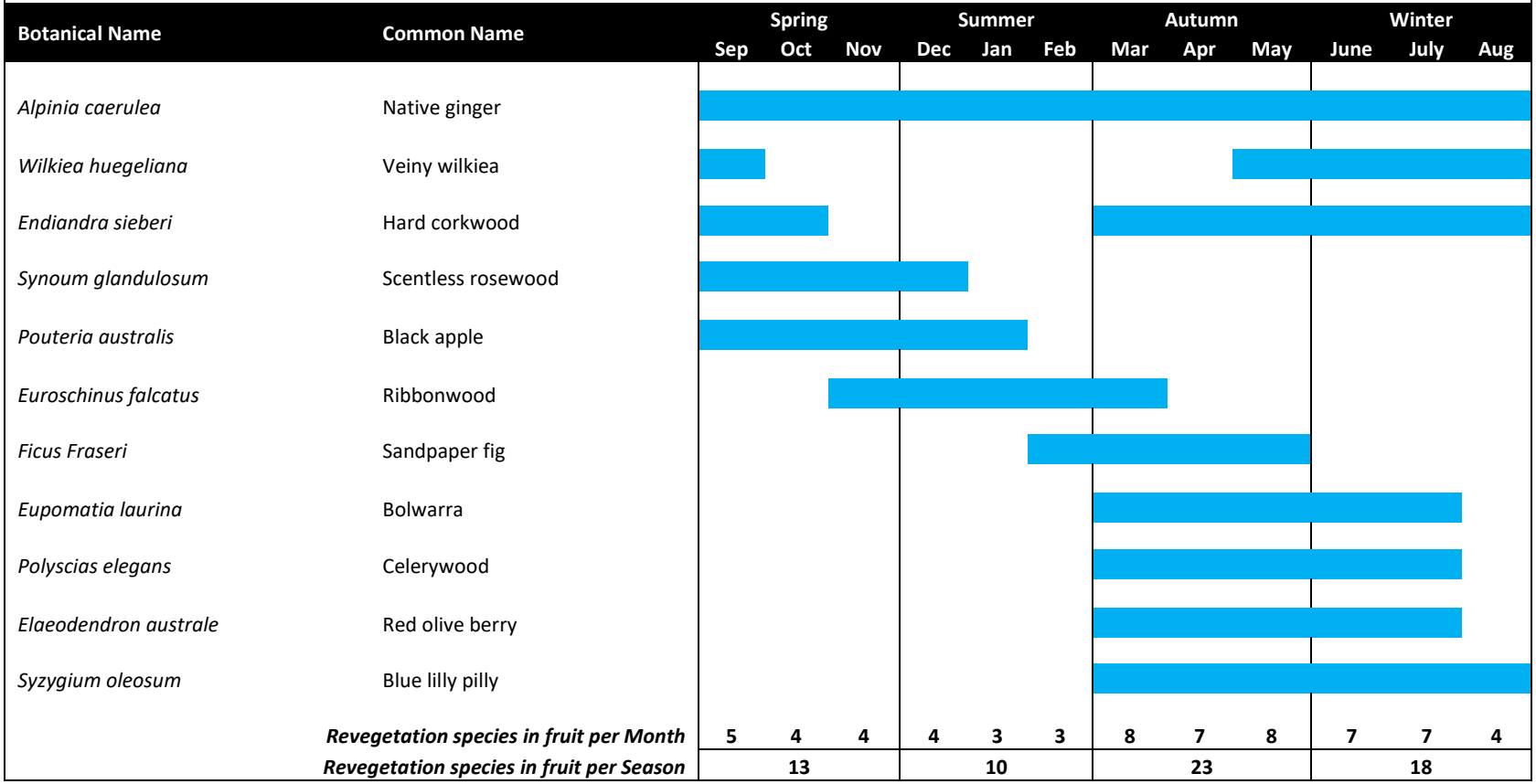


Botanical Name	Common Name	Spring			Summer			Autumn			Winter		
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Ficus rubiginosa	Rusty fig												
Ficus henneana	Deciduous fig												
Arytera divaricate	Coogera												
Acronychia oblongifolia	Common acronychia												
Myrsine variablis	Variable leaf muttonwood												
Duboisia myoporoides	Corkwood												
Cissus antarctica	Water vine												
Smilax australis	Lawyer vine												
Solanum aviculare	Kangaroo apple												
Alphitonia excelsa	Red ash												
Cryptocarya microneural	Murrogun												
Myrsine howittiana	Muttonwood												
Podocarpus elatus	Plum pine												
Pittosporum undulatum	Sweet pittosporum												
Non-common species in fruit per Month		**5**	**7**	**7**	**7**	**7**	**8**	**9**	**9**	**8**	**7**	**6**	**5**
Non-common species in fruit per Season		**19**			**22**			**26**			**18**		

Non-common species have small population sizes on site.

WALLABI POINT LITTORAL RAINFOREST SEASONAL FRUITING CALENDAR

REVEGETATION SPECIES



Botanical Name	Common Name	Spring			Summer			Autumn			Winter		
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Alpinia caerulea	Native ginger												
Wilkiea huegeliana	Veiny wilkiea												
Endiandra sieberi	Hard corkwood												
Synoum glandulosum	Scentless rosewood												
Pouteria australis	Black apple												
Euroschinus falcatus	Ribbonwood												
Ficus Fraseri	Sandpaper fig												
Eupomatia laurina	Bolwarra												
Polyscias elegans	Celerywood												
Elaeodendron australe	Red olive berry												
Syzygium oleosum	Blue lilly pilly												
	Revegetation species in fruit per Month	**5**	**4**	**4**	**4**	**3**	**3**	**8**	**7**	**8**	**7**	**7**	**4**
	Revegetation species in fruit per Season	**13**			**10**			**23**			**18**		

Revegetation species have nil or only one or two plants on site

WALLABI POINT LITTORAL RAINFOREST SEASONAL FRUITING CALENDAR MONTHLY FRUITING SPECIES												
	Sep	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**
Common species in fruit per Month	**0**	**2**	**3**	**6**	**8**	**8**	**9**	**8**	**6**	**2**	**2**	**1**
Non-common species in fruit per Month	**5**	**7**	**7**	**7**	**7**	**8**	**9**	**9**	**8**	**7**	**6**	**5**
Revegetation species in fruit per Month	**5**	**4**	**4**	**4**	**3**	**3**	**8**	**7**	**8**	**7**	**7**	**4**
Total Per Month	**10**	**13**	**14**	**17**	**18**	**19**	**26**	**24**	**22**	**16**	**15**	**10**

Summary:

Common species, have large populations sizes on site. *Non-common species,* have small population sizes on site. *Revegetation species,* have nil or only one or two plants on site but the species are present in the Saltwater, Old Bar and Manning Point littoral rainforest and their presence in the Wallabi Point littoral rainforest can assist in improving foraging and genetic corridors.

The seasonal fruiting analysis indicates the *common species* on site are predominantly summer and autumn fruiting, with a significant decline in spring and winter fruiting. As the dominant fruiting species on site, this indicates an imbalanced seasonal supply of food across the forest.

The *non-common species* offer greater foraging resource options over the spring and winter periods, however as the population size of these species is limited, they do not offer a reliable foraging resource. Population expansion planting of these species will improve the foraging resources opportunities.

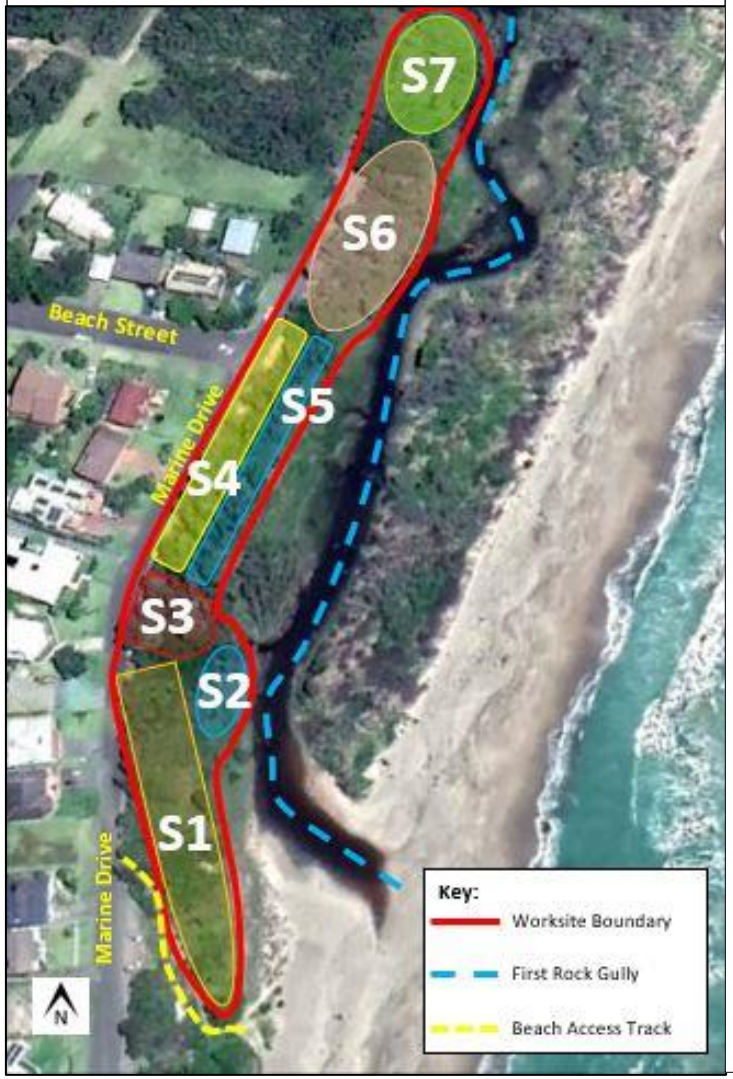
Additionally, biodiversity improvement *revegetation* plantings can enhance foraging resource opportunities.

The *revegetation species* being planted across the forest, when matured and with a suitable population size, will improve the current seasonal imbalance and provide seasonally balanced foraging resources and opportunities for wildlife. The revegetation strategy also aims to achieve the *National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community* objective, to plant appropriate vegetation, improve condition and complexity and improve connectivity.

The analysis indicates that the objective to provide balanced foraging resources throughout the year for omnivore, frugivore and nectivore wildlife by improving the *non-common* and *revegetation* species is achievable.

Attachment G: 'Wallabi Point Littoral Rainforest Rehabilitation Strategy'

Wallabi Point Littoral Rainforest
Post Fire Rehabilitation Strategy – South Zone
Prepared by Tony Wales January 2022



Zone S1:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Restore degraded patch, establish natural buffer (Seaward edge buffer) and improve condition & complexity
Rehabilitation Strategy: Natural Regeneration / Weed / Population Expansion Plantings
Fire Damage Observations: Some canopy damage. Midstory and vines damaged
Burn Spatial Impact: Cool burn

Zone S2 and S5:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Establish natural buffer (Seaward edge buffer) and improve condition & complexity
Rehabilitation Strategy: Natural Regen / Weed / Population expansion plantings
Fire Damage Observations: Seaward buffer severely damaged
Burn Spatial Impact: Hot to moderate burn

Zone S3:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Restore degraded patch, improve condition and complexity, reduce threats.
Rehabilitation Strategy: Natural Regeneration / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Significant canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Moderate burn.

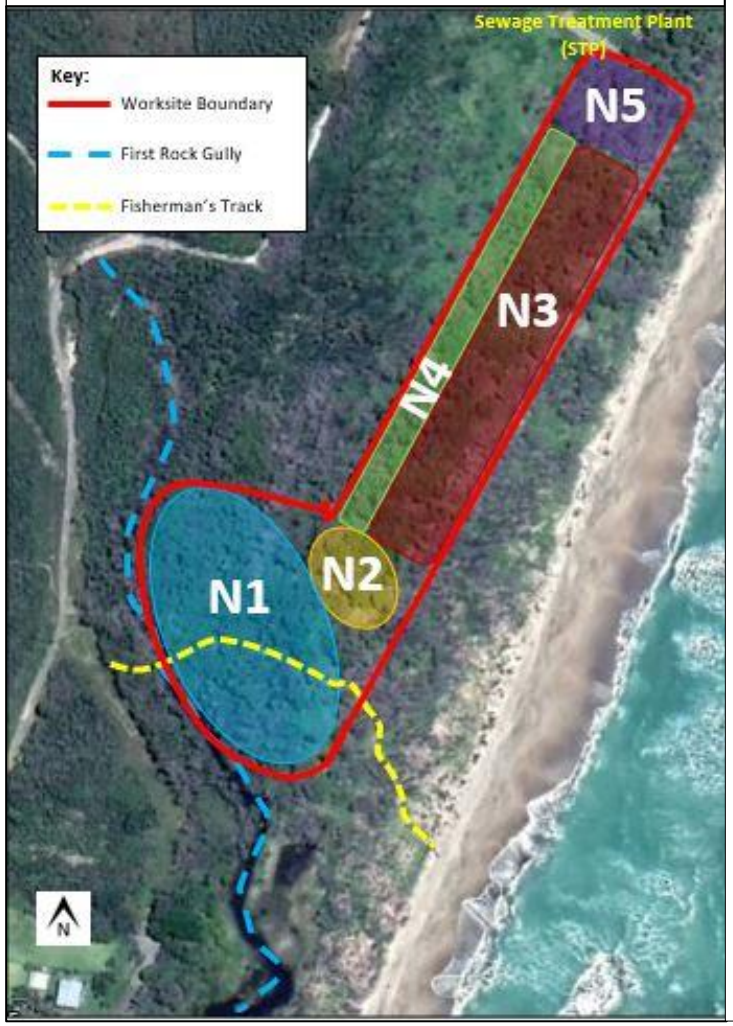
Zone S4:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Restore degraded patch and improve condition & complexity, reduce threats
Rehabilitation Strategy: Natural Regen / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Minor canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Cool burn.

Zone S5:
See Zone S2

Zone S6:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Minimal intervention. Signs of good resilience. Restore degraded patches
Rehabilitation Strategy: Natural Regen / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Canopy damaged. Understory, midstory and vines damaged
Burn Spatial Impact: Cool to moderate burn

Zone S7:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Restore degraded patch, improve condition & complexity. Restore connectivity with North Zone (across First Rock Gully)
Rehabilitation Strategy: Natural Regen / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Extensive canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Hot burn.

Wallabi Point Littoral Rainforest
Post Fire Rehabilitation Strategy – North Zone
Prepared by Tony Wales January 2022



Zone N1:
Vegetation Association: Tuckeroo Paperbark
Primary Rehab Objective: Improve condition and complexity and improve connectivity with South Zone
Rehabilitation Strategy: Natural Regeneration / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Some canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Cool burn with some hot patches.

Zone N2:
Vegetation Association: Tuckeroo Paperbark association ecotone to Tuckeroo Guoia association
Primary Rehab Objective: Restore degraded patch, improve condition & complexity, improve connectivity between N1 and N3.
Rehabilitation Strategy: Natural Regen / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Extensive canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Hot burn.

Zone N3:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Improve condition & complexity, reduce threats
Rehabilitation Strategy: Natural Regeneration / Weed / Biodiversity plantings
Fire Damage Observations: Minor canopy damage Understory, midstory and vines damaged
Burn Spatial Impact: Hot burn.

Zone N4:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Restore degraded patch, establish natural buffer (Landward Buffer) and improve condition & complexity
Rehabilitation Strategy: Natural Regen / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Extensive canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Hot burn.

Zone N5:
Vegetation Association: Tuckeroo Guoia
Primary Rehab Objective: Restore degraded patch, establish natural buffer (to STP), improve condition & complexity and improve connectivity to extant littoral rainforest along STP eastern boundary and northwards to Old Bar
Rehabilitation Strategy: Natural Regen / Weed / Population expansion and biodiversity plantings
Fire Damage Observations: Extensive canopy damage. Understory, midstory and vines damaged
Burn Spatial Impact: Very Hot burn.

NOTE: Seaward Buffer currently provided by Bitou Bush which should be excluded from littoral rainforest