



**6.2 e Vegetation management plan for the littoral rainforest and coastal vine thicket J Webber**

# Vegetation management plan for the littoral rainforest and coastal vine thicket plant community located on the Ella Bay Integrated Resort site



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Report by Jason Weber



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## Introduction and background

The Ella Bay Integrated Resort (EBIR) is located in the Wet Tropics region of North Queensland, near the township of Innisfail. Adjacent to the EBIR site is the World Heritage listed Ella Bay National Park. The EBIR site itself is not within the World Heritage area however maintains a unique yet degraded environment. The main sources of degradation are historic logging and clearance for pasture; weed invasion; and damage caused by native (agile wallabies) and introduced (pigs) animal activity.

Along the south-eastern boundary of the EBIR site occurs the vegetation community 'Littoral Rainforest and Coastal Vine Thicket' (hereafter littoral rainforest, map 1, RE 7.2.5). This vegetation community is listed as critically endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) as well as being listed as a Regional Ecosystem (RE) 'of concern' under the *Vegetation Management Act 1999* (Qld).

The degraded littoral rainforest community found on the EBIR site suffers from extensive levels of weed invasion, wind damage as well as wallaby damage (through understorey browsing and trampling). The declared weed *Annona glabra* (pond apple) forms dense stands throughout the littoral rainforest area. In these areas, habitat loss is occurring through the replacement and suppression of native plant species. Pond apple could also be a key threatening process to Endangered, Vulnerable and Rare (EVR) plants found on site (WONS 2000). In addition to dense stands, pond apple also displaces other native plants by readily germinating on, and rooting from, parts of existing vegetation. Pond apple will readily germinate and root from the crown of large sedges (i.e. *Scirpodendron ghaeri*), trunk hollows of trees and the bark of paperbark trees (*Melaleuca* sp.). The seeds are deposited in these areas by high tides, storm surges and wet season water level rises.

In addition to pond apple, *Urochloa maxima* (guinea grass) and *Allamanda cathartica* (allamanda) pose a threat to trees located around the edge of the littoral rainforest. Due to the tall, dense growth habit of guinea grass and the smothering habit of allamanda, the movement of native animals into and out of the littoral rainforest may be impeded. While the density of *Psidium guajava* (guava) is currently low in this area, experience overseas shows that this species can become a serious transformer weed (Tye *et al.* 2002)

Over most of the community there are large amounts of understorey damage caused by Agile wallaby browsing and trampling. Due to high levels of wallaby herbivory on tree and shrub seedlings as well as herbaceous groundcover species, there is very limited native species regeneration. This has caused canopy gaps to remain open for unnaturally long periods of time which in turn encourages invasion of the area by pond apple and other weed species. Wallabies also readily eat the fruit of pond apple and act as seed dispersers for this highly invasive weed species.

Some native plant species' seedlings such as *Chionanthus ramiflora* (native olive) appear to be unpalatable to wallabies. This leads to an unnaturally high density of these species seedlings in the plant community which has the potential to alter its composition and structure. This has been seen in other plant communities where an increase or decrease in selective predation has caused changes to plant community composition and structure .

## **Objectives of the revegetation and weed management plan for the littoral rainforest community located on the EBIR site**

The primary objective of this management plan is to afford this littoral rainforest vegetation community a level of protection that is consistent with relevant Commonwealth and State legislation. In addition to legislative requirements, this management plan aims to enhance existing littoral rainforest vegetation for the protection of EVR animals, plants and ecological communities.

### **Site description**

On the EBIR site, littoral rainforest is located in back dune situations and forms an open to closed forest with canopy heights up to 28m. The dominant canopy species are *Euroschinus falcatus*, *Syzygium forte* subsp. *forte*, *Canarium australianum* and *Chionanthus ramiflorus*. The area mapped as littoral rainforest actually contains extensive areas of dense pond apple interspersed with fragmented, remnant patches of littoral rainforest. The vegetation in this area has suffered from past disturbance as is evident by regular canopy gaps, coppicing of *Syzygium forte* subsp. *forte* and the dominance of *Euroschinus falcatus* (3D Environmental 2009). The littoral rainforest area can be seen on the map in Appendix 1.

### **Threatening processes**

There have been several threatening processes identified as posing a realised or potential risk to the littoral rainforest vegetation community present on the EBIR site. All of the realised threatening processes have been active on the site for some years and include:

- 1) Weed invasion and subsequent native plant species displacement, habitat loss and impedance to movement;
- 2) Understorey damage caused by unnaturally high densities of wallabies trampling and grazing;
- 3) Wind damage caused during high wind events such as cyclone Larry;
- 4) Wallaby and storm surge pond apple seed dispersal.

Threatening processes caused by weeds and wallabies have the effect of severely reducing natural rainforest regeneration which in turn results in the inability of the vegetation to rapidly recover from wind damage events. These events cause gaps in the canopy to form and tree falls. In the absence of native plant seedlings in the understorey vegetation, highly invasive and unpalatable weed species such as pond apple invade the area and over time, along with subsequent disturbance events, may completely displace native species and transform the vegetation into a persistent pond apple monoculture. The lack of natural regeneration and pond apple invasion lead to habitat loss in this threatened ecological community. A number of other weed species pose a threat to the littoral rainforest. These include guava, Singapore daisy, guinea grasses and allamanda.

In addition to these realised threatening processes, development and construction of the entry road and resort areas may cause accidental damage to part of the littoral rainforest. These activities may also change the hydrological processes on the site which could also impact on this vegetation community. Introduction of new weed species to the site is also a foreseeable risk. Management of these risks are covered in the EBIR management plan

as well as the management sub-plans for flora, revegetation and rehabilitation as well as weeds and as such will not be discussed further in this document.

## **Management actions to reduce or eliminate threatening processes**

### Wallaby exclusion

Wallaby proof fences should be erected around the littoral rainforest area in order to reduce or eliminate trampling and seedling/understorey herbivory. These fences should be established as soon as possible and before any revegetation work commences where possible. If pond apple control will damage fences, control operations for pond apple should be conducted around the fence perimeter first. If fencing proves to be impractical, other seedling protection measures such as protector bags should be used.

### Weed control

Weed control should also commence as soon as possible with pond apple being the top priority due to its density and impact on site. The best way to control tree and sapling pond apple in this environment is to use the cut stump method of herbicide application. The herbicide to be used is Glyphosate with an environmentally sensitive surfactant (i.e. Roundup Bioactive<sup>®</sup>, Appendix 2.). This is to be applied immediately after the trunk has been cut. Ensure that for multi-stemmed trees, all stems receive herbicide treatment. The same treatment can be used for guava and introduced scrambler/vine control. Singapore daisy can be controlled through the application of Metsulfuron-methyl (i.e. Brush-Off<sup>®</sup>) and an environmentally sensitive surfactant as a foliar spray. Where there are dense carpets of pond apple seedlings or disturbance weeds, control can be achieved through the application of Glyphosate as a foliar spray. A summary table of herbicide application methods and concentrations can be found Appendix 2.

Due to the naturally high rates of pond apple seedling mortality and the risk of off-target herbicide damage caused by foliar spraying, sparse to medium density patches of pond apple can either be hand pulled or left and controlled using the cut stump method in follow up control operations.

Weed control operations that involve felling pond apple trees will be supervised by an environmental officer. The officer will ensure that any EVR plant species found on the pond apple tree trunks is appropriately handled and suitable translocation sites are found as soon as possible.

There are also several large mango trees within the littoral rainforest area. These exotic fruit trees will be left in place for the time being and will either be permanently left on site or removed once revegetation plantings are fruiting. Mangoes are eaten by some native animal species and are not a highly invasive weed species like pond apple.

### Follow-up control

Follow-up control activities will occur if site inspections reveal pond apple regrowth after initial treatment. Inspections will occur several months after initial control and continue for at least two years. If a major disturbance event such as a cyclone occurs and causes canopy damage, conduct follow up inspections, and where necessary control work, for two

years after the event. A similar time frame should be used for the follow up treatment of guava. Following initial control, lantana and giant bramble should also be subject to site inspections for regrowth every few months to determine if follow-up control is necessary. Singapore daisy and disturbance weeds should be subject to follow up treatments several times a year in forest areas and two to four years in revegetation areas. The need for non-scheduled follow up work will be noted in the monthly progress/monitoring report.

### Revegetation and restoration

The revegetation and restoration activities on site will be directed towards repairing the pre-existing damage to the littoral rainforest caused by disturbance and weed invasion. In addition to this, efforts will be made to increase the current area of littoral rainforest by re-planting former pasture areas. Revegetation is closely associated with weed control and is the best method for long-term, herbicide free control of the most damaging weeds found on the EBIR site. Due to the dense stands of pond apple in and around the littoral rainforest area, revegetation will be important both for suppressing pond apple regeneration and improving vegetation structure. Vegetation structural complexity decreases when the dominant vegetation contains dense stands of pond apple. Once wallabies are excluded from the littoral rainforest area natural regeneration and understorey planting will be effective at closing canopy gaps.

Due to the narrow width of the littoral rainforest at the EBIR site, high density and edge plantings should be used to minimise edge effects such as wind and light penetration. The edge plantings have been shown to be effective at reducing light and wind penetration in other areas of the wet tropics (Freebody 2007).

The temporal nature of rainforest plant species seed production and their seeds limited longevity requires two plantings to occur in order to capture maximum diversity. The initial planting should occur at the start of the wet season and the second should occur several months later. The species list to use can be found in Appendix 3. The species in the list are found on the EBIR site, coastal and access road areas, other areas of the Wet Tropics as well as the Schedule list (Garrett 2008). The species composition of littoral rainforest communities is considered to be similar to surrounding lowland areas with some unique elements (Kooyman and Rossetto 2006). Therefore, species suitable for inclusion are likely to be found elsewhere on the site with those listed in the schedule considered to be the 'unique' species. These 'unique' species should contribute 25% to the total stem number. Species such as *Syzygium forte* subsp. *forte* and *Chionanthus ramiflora* should always be used due to their importance in the Regional Ecosystem classification.

The initial species planting composition is to contain trees and shrubs with no more than 5% pioneer and 5% early secondary species by stem number (see Appendix 1). This approach has been shown to be successful in other areas of the wet tropics (Freebody 2007). At least 10 to 20 plant species should be used in this initial planting. The plants are to have a spacing of two metres. Pre-planting weed control is to occur at least two weeks before planting commences for glyphosate and four weeks for metsulfuron methyl based herbicide treatments.

The secondary species planting composition is to contain trees, shrubs and herbaceous understorey plant species. No additional pioneer and early secondary plant species should be planted at this stage and attention should be focused on planting more successional advanced species as well as sun intolerant shrubs and herbs. The spacing of this secondary planting should be one metre due to the small size of a number of the plant species. At least two follow up weed control operations should be conducted by this stage and attention should be given to ensuring that the time between herbicide application and planting is the same for the initial planting. The double planting of revegetation areas will help suppress pond apple regeneration that is inevitable given the dense infestations of this weed prior to control operations.

In addition to the initial and secondary plantings, opportunistic plantings of species for aesthetic or conservation (EVR species) purposes can be conducted. The rate of the opportunistic planting will vary in accordance with supply of seedlings and may be conducted over several years particularly where epiphytes are concerned.

Along the edges of the replanting area, a strip of dense edge plantings may occur. Species suitable for this edge include sun tolerant small trees, shrubs and herbaceous plants. Species suitable for edge plantings can be found in Appendix 2. The spacing for these edge plantings should be one metre in order to rapidly seal edges to reduce weed invasion and wind as well as light penetration. The development of the understorey will be accelerated by doing this.

Around the edge of the current littoral rainforest, a ten metre wide strip of pasture may be revegetated. In these pasture areas the grass will need to be foliar sprayed with Glyphosate (see Appendix 2.). One to two treatments will be needed depending on regrowth. The planting pattern and the species composition should be the same as the initial and secondary plantings for the understorey areas in the first few metres of pasture with the edge plantings forming the remainder.

Along the edge of the current littoral rainforest there are several logs from previous felling activities. These should be removed and placed amongst the plantings in the pasture area and/or pushed back into the existing littoral rainforest vegetation to increase understorey structural complexity.

## **References**

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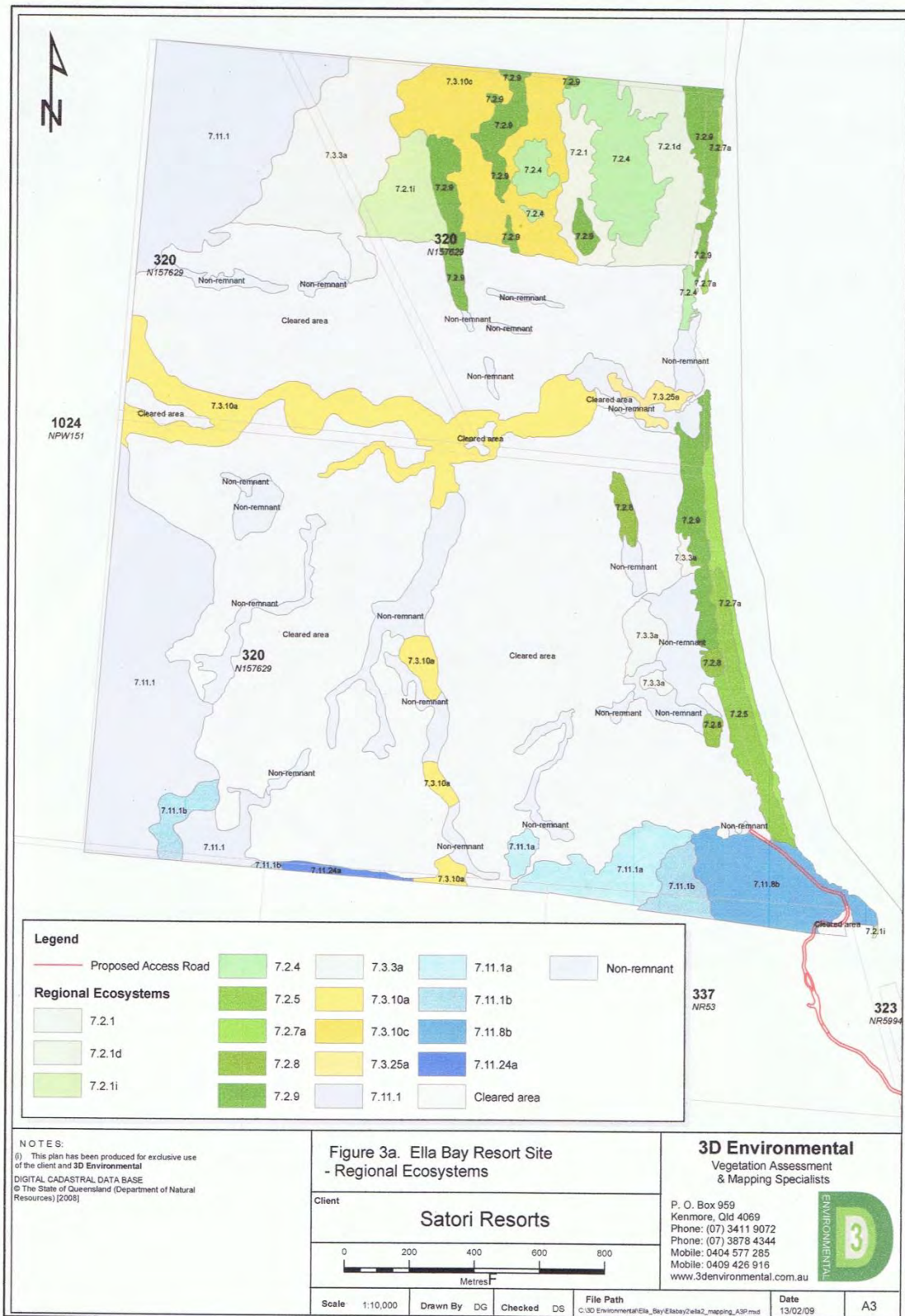
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Appendix 1. Regional Ecosystems (RE) found on the EBIR site. The RE of interest (7.2.5) is light green in colour and found in the south-east section of the map.



Appendix 2. Summary of weed control methods.

Weed species	Control Method	Herbicide	Herbicide concentration (Herb:water)
Pond apple – Trees and saplings	Cut stump	Glyphosate	1:1
Pond apple – Dense seedlings	Foliar spray	Glyphosate	1:100
Pond apple – sparse to medium seedlings	Hand pull or leave		
Guava	Cut stump	Glyphosate	1:1
Lantana, allamanda and giant bramble	Cut stump	Glyphosate	1:1
Singapore daisy	Foliar spray	Metsulfuron-methyl	Recommended concentration
Disturbance weeds and pasture grass	Foliar spray	Glyphosate	1:100
Tall grasses	Brush cut and foliar spray regrowth	Glyphosate	1:100