Transport
Roads & Maritime
Services

# Pacific Highway NH2U Threatened Flora Monitoring Year 3 April 2020

## Threatened Flora Monitoring – 2019/20

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# Pacific Highway Upgrade - Nambucca Heads to Urunga Operational Phase Threatened Flora Monitoring Year 3 Annual Report

This report, **Pacific Highway Upgrade Nambucca Heads to Urunga Operational Phase - Threatened Flora Monitoring Year 3 Annual Report**, was prepared for Transport for NSW (formerly NSW Roads and Maritime Services) in accordance with the NSW *Environmental Planning and Assessment Act* 1979, the NSW *Biodiversity Conservation Act* 2016 and the Commonwealth *Environmental Protection and Biodiversity Conservation Act* 1999.

The author of this report is Peter Richards, Consultant Ecologist, whose qualifications are B.Sc. (UNE).

Any opinion expressed in this report is the professional, objective opinion of the author.

June 2020

*Title Page Images*

Top: Spider Orchid *Dendrobium melaleucaphilum* – a wild plant within Translocation Area 2.

Bottom: Sector A Slender Marsdenia *Marsdenia longiloba* recipient site within Translocation Area 1.

Images taken by Peter Richards, February 2020.

**TABLES**



**FIGURES**

**GLOSSARY**

| TERM | MEANING |
|---|---|
| ANPC | Australian Network for Plant Conservation |
| BC Act | NSW *Biodiversity Conservation Act* 2016 |
| EPBC Act | Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 |
| EP&A Act | NSW *Environmental Planning and Assessment Act* 1979 |
| *In situ* | Latin term meaning 'in the original place'. In this report, refers to threatened plants that are being protected where they were found |
| LGA | Local Government Area |
| MCoA | Ministers Conditions of Approval |
| NH2U | Nambucca Heads to Urunga Pacific Highway Upgrade Project |
| NSW EPA | NSW Environment Protection Authority |
| NSW OEH | NSW Office of Environment and Heritage |
| RMS | NSW Roads and Maritime Services (now known as Transport for NSW) |
| TA | Translocation Area |
| TFMP | Threatened Flora Management Plan (Ecos Environmental 2013) |
| TfNSW | Transport for NSW (formerly RMS) |
| TSC Act | NSW *Threatened Species Conservation Act* 1995 |

## INTRODUCTION

The Nambucca Heads to Urunga Pacific Highway Upgrade Project (NH2U) is a 22-km-long section of the Pacific Highway upgrade on the Mid North Coast of NSW. The NH2U project comprises the northern half of the Warrell Creek to Urunga section of the Pacific Highway upgrade, which is being built in two stages. Mitigation measures employed during the construction of NH2U included *in situ* protection, or translocation, and monitoring, of populations of the following eight threatened or rare plant species:

Spider Orchid *Dendrobium melaleucaphilum* (Endangered, BC Act)

Red Bopple Nut *Hicksbeachia pinnatifolia* (Vulnerable, BC Act & EPBC Act)

Slender Marsdenia *Marsdenia longiloba* (Endangered, BC Act; Vulnerable, EPBC Act)

Rusty Plum *Niemeyera whitei* (Vulnerable, BC Act)

Woolls's Tylophora *Tylophora woollsii* (Endangered, BC Act & EPBC Act).

Koala Bells *Artanema fimbriatum* (unlisted, nationally rare)

Gully Ironbark, Nambucca Ironbark *Eucalyptus ancophila* (unlisted, local endemic species)

Ford's Goodenia *Goodenia fordiana* (unlisted, nationally rare)

### *In situ* flora populations

One component of the mitigation measures employed on the NH2U project involved the protection and monitoring of *in situ* plants of Spider Orchid, Slender Marsdenia and Gully Ironbark that remain within the NH2U road reserve and were not directly impacted by the project. Baseline data collection, and construction phase monitoring, has been undertaken on 76 Spider Orchid plants, five Slender Marsdenia plants and a single Gully Ironbark (Ecos Environmental 2014, 2016, 2017) which are located at various points in the road reserve along the NH2U route (Figure 1).

### Translocated Flora Species

Where threatened or rare plants were recorded within the NH2U construction footprint and direct impact was unavoidable, a program was developed to guide the translocation and monitoring of Spider Orchid, Red Bopple Nut, Slender Marsdenia, Rusty Plum, Woolls's Tylophora, Koala Bells and Ford's Goodenia from the construction footprint into one of two recipient sites (Translocation Areas, TA1 and TA2) that adjoin the NH2U footprint and are owned and managed by NSW Roads and Maritime (now known as Transport for NSW (TfNSW)) (Figure 1).

The translocations were conducted according to the Warrell Creek to Urunga Threatened Flora Management Plan (TFMP, Ecos Environmental 2013), which was prepared as a condition of approval by the NSW Department of Planning and the Commonwealth Department of Environment.

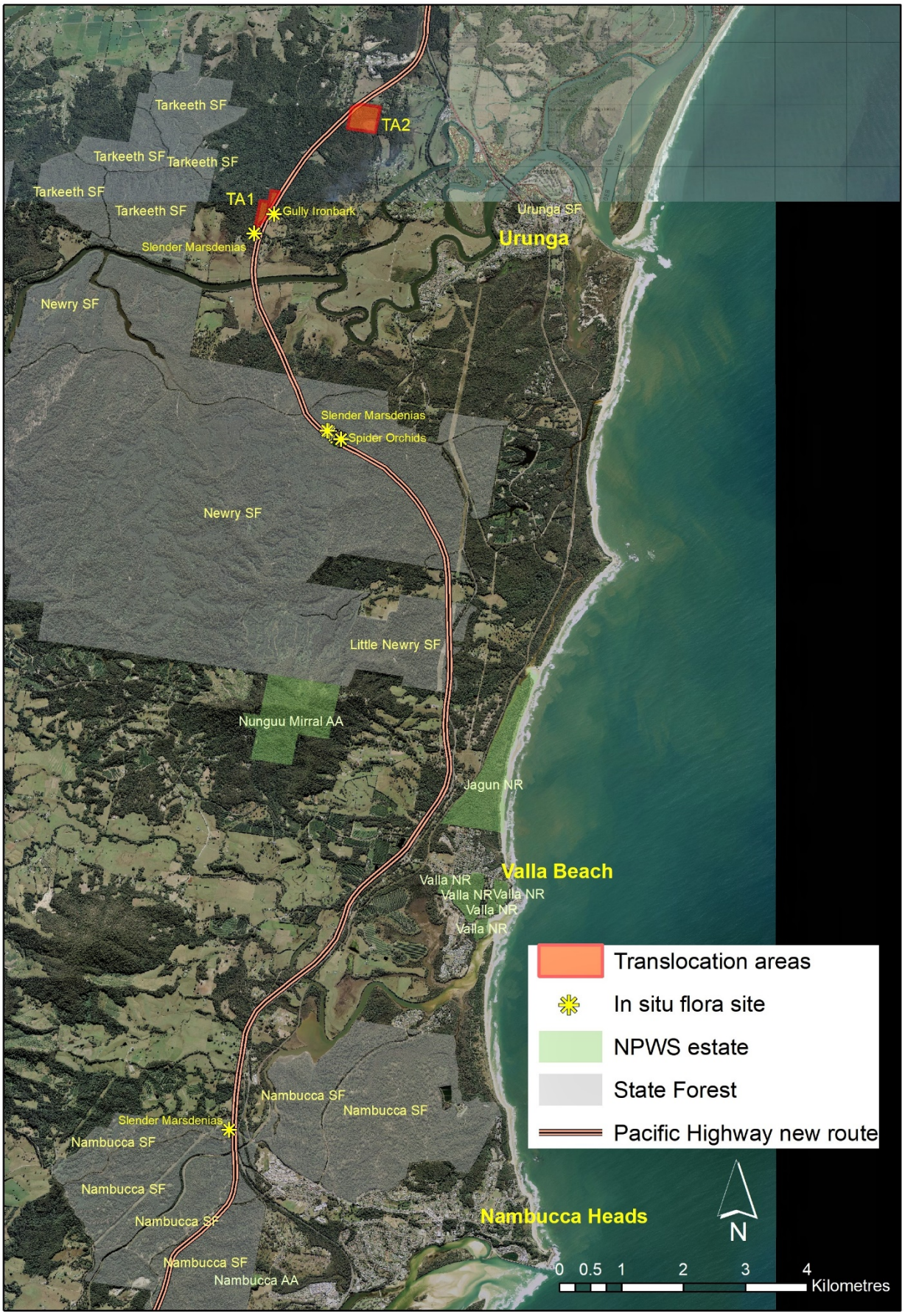


*Figure 1: Location of NH2U in situ and translocated threatened or rare flora monitoring sites.*

**Translocation methods and planting layout**

A detailed description of the actual salvage and translocation methodology is provided in Ecos Environmental (2013, 2014a, 2016a, 2016b). The summary provided below is also drawn from these Ecos Environmental reports and explains the source of plant material (transplanted from construction footprint or propagated off-site), whether a slow-release fertiliser was applied, and the location within TA1 or TA2 of the transplants or enhancement plantings.

*Translocation Area 1*

TA1 was divided into ten sectors (A to J, Figure 2) each receiving one species and different introduction treatments, as described below:

- Transplanted from construction footprint with no addition of fertiliser.
  - Sector A Slender Marsdenia
  - Sector B Woolls's Tylophora
- Transplanted from construction footprint with no fertiliser except initial watering with seaweed solution.
  - Sector C Ford's Goodenia
  - Sector D Koala Bells
  - Sector E Rusty Plum
- Propagated vegetatively and planted in experimental grids with and without addition of slow-release fertiliser.
  - Sector F Slender Marsdenia
  - Sector G Woolls's Tylophora
  - Sector I Woolls's Tylophora
- Propagated from seed and planted in an experimental grid with and without addition of slow-release fertiliser.
  - Sector J Slender Marsdenia
- Transplanted from construction footprint with no fertiliser except initial watering with seaweed solution.
  - Sector H Red Bopple Nut

*Translocation Area 2*

TA2 consists of two sectors, for the Spider Orchid and Koala Bells (Figure 3).

- Spider Orchid transplanted from construction footprint, no fertiliser addition – Sector A
- Koala Bells population enhancement, no fertiliser addition – Sector B

Individuals were planted at a regular spacing, with rows about 10m apart and individual plants about 5 metres apart along rows. Where a sector was on a hill slope, grid lines were laid out parallel with the slope contour. This facilitated comparison of species performance in relation to slope position.

Monitoring, to date, has been undertaken for a total of 681 translocated plants (Ecos Environmental 2014, 2016, 2016a) as detailed in Table 1 below.

*Table 1:Number and location of translocated plants and enhancement plantings at NH2U Translocation Areas.*

| Translocation Area (TA) | Species | Sector / Method | Number of plants |
|---|---|---|---|
| TA1 | Slender Marsdenia | Sector A – transplants | 104 |
| | | Sector F – population enhancement (veg) & fertilizer experiment | 90 |
| | | Sector J – population enhancement (seed) & fertilizer experiment | 103 |
| | Woolls's Tylophora | Sector B – transplants | 42 |
| | | Sector G – population enhancement (veg) & fertilizer experiment | 87 |
| | | Sector I – population enhancement (veg) | 51 |
| | Rusty Plum | Sector E – transplants and population enhancement (seed) | 3 trees<br>40 seeds |
| | Red Bopple Nut | Sector H - transplant | 1 |
| | Koala Bells | Sector D - transplants | 35 |
| | Ford's Goodenia | Sector C – transplants | 5 patches |
| TA2 | Spider Orchid | Sector A - transplants | 55 |
| | Koala Bells | Sector B - population enhancement (veg) | 69 |

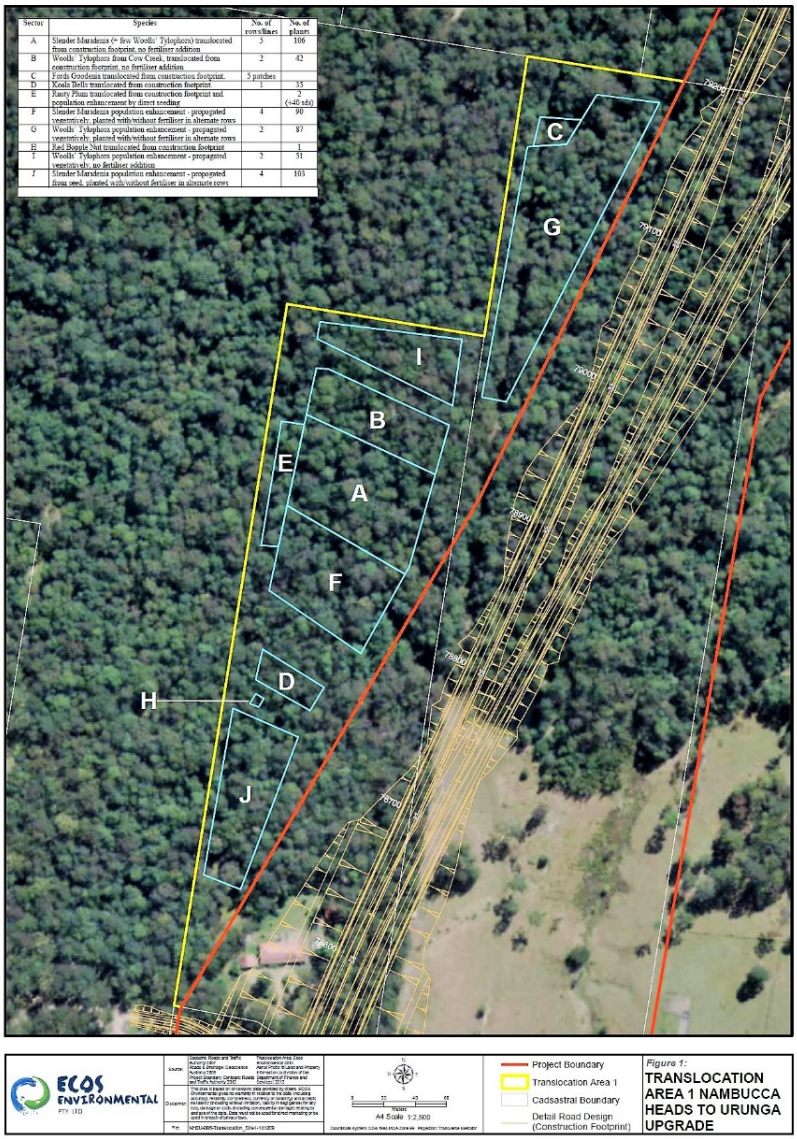


*Figure 2: Translocation Area 1 (TA1) showing sectors supporting different species and treatments (from Ecos Environmental 2016a).*

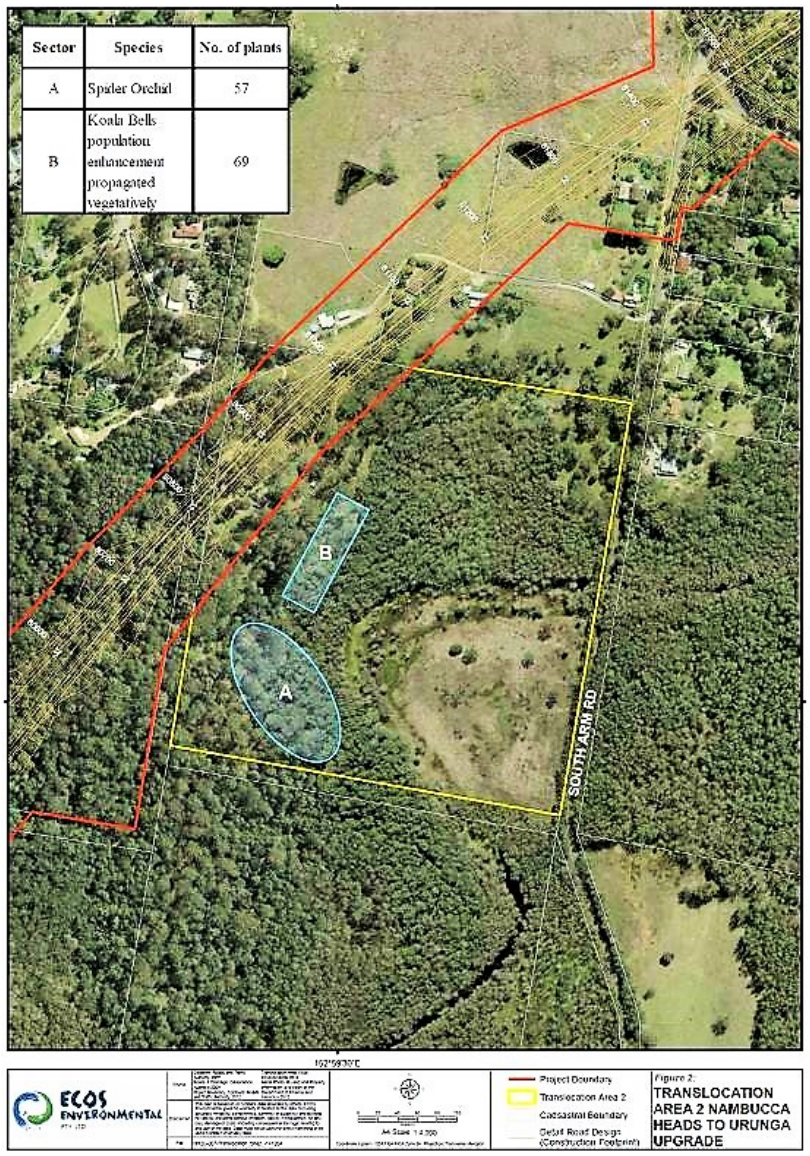


*Figure 3: Translocation Area 2 (TA2) showing sectors supporting different species and treatments (from Ecos Environmental 2016a).*

### *Objectives of translocation*

The objectives of the translocation project set out in the TFMP are:

- To salvage and re-establish impacted individuals of threatened (TSC/BC/EPBC Act) species.
- To re-establish species at a recipient site near the original site with closely matching habitat and long-term security of tenure.
- To enhance the size and genetic diversity of the translocated population by propagation and introduction of individuals additional to those salvaged from the road footprint.
- To maintain good quality habitat to the relocation site(s).
- To preserve individuals of threatened species *in situ* wherever possible and limit translocation to plants within the highway footprint and construction buffer.

In accordance with the Ministers' Conditions of Approval (MCoA) for the TFMP, an annual monitoring report is to be prepared which addresses the monitoring goals, provides an evaluation of the effectiveness of the mitigation measures against performance indicators, documents any corrective actions implemented, and identifies recommendations for any adaptive management.

Upon completion of the construction phase of the NH2U upgrade, responsibility for operational management passed to TfNSW. This report describes the results of Year 3 (operational phase) monitoring of *in situ* and translocated flora for the NH2U upgrade. It should be noted that, upon completion of construction phase monitoring of translocated plants, monitoring of those species not listed as threatened under the TSC (BC) Act or the EPBC Act (Koala Bells and Ford's Goodenia) has been discontinued.

## MONITORING METHODS

Monitoring of all *in situ* and translocated plants was undertaken in February 2020 (see comments below regarding delays to this year's survey).

The following description of the NH2U flora monitoring methodology is adapted from Ecos Environmental (2014 to 2017). During the NH2U construction phase, monitoring of transplants was conducted every 3 months in Year 1, every 6 months in Year 2 and annually in Year 3. Population enhancement individuals were monitored twice in Year 1 thence at the same time as transplanted individuals. Ongoing monitoring during the NH2U operational phase is to be undertaken annually for a minimum five years.

Each transplanted and propagated plant was given a unique identification number which was written on flagging tape and attached to the plant itself, or to its protective wire cage. Transplants were re-located in the field using a hand-held GPS to navigate to a set of coordinates that had been recorded when the plants were introduced to the sites (in some cases coordinates were not available – in such cases a thorough search of the relevant sector was undertaken by the author, and each transplant found had locality coordinates recorded with a GPS unit). Data were recorded as per Section 3.8 of the TFMP and listed in Table 2 below.

*Table 2: Monitoring data recorded for each translocated species.*

| Data Recorded | Slender Marsdenia | Woolls's Tylophora | Rusty Plum | Red Bopple Nut | Spider Orchid |
|---|---|---|---|---|---|
| **Monitoring Number** | y | y | y | y | y |
| **Date** | y | y | y | y | y |
| **Line** | y | y | - | - | - |
| **Source Label** | y | y | y | - | y |
| **Translocation Label** | y | y | y | y | y |
| **Species - Current ID** | y | y | - | - | - |
| **Condition Class** | y | y | y | y | y |
| **No. leaves** | y | y | - | - | |
| **Height (cm)** | y | y | y | y | |
| **New Shoots – New Active Growth (Y/N)** | y | y | y | y | y |
| **Comment** | y | y | y | y | y |
| **No. of pseudobulbs with leaves** | - | - | - | - | y |
| **Length of the longest pseudobulb** | - | - | - | - | y |
| **Waypoint** | y | y | y | y | y |
| **Coordinates** | y | y | y | y | y |

### Condition Class Scores

The key attribute for evaluating species survival and performance was Condition Class, which was scored on a scale of 0 to 5. The scores were defined differently according to plant type, as detailed below in Table 3, Table 4 and Table 5.

*Table 3: Condition scores applied to Slender Marsdenia and Woolls's Tylophora.*

| Score | Condition |
|---|---|
| 0 | dead |
| 1 | stem died back to ground, no leaves or green stem, live stem stub may be present |
| 2 | plant < 75 cm tall; stem with leaves, with or without new shoots (active growth), or green leafless stem |
| 3 | plant > 75 cm tall, stem with leaves, with or without new shoots (active growth), if green leafless stem <1m or leaves discoloured score as 2 |
| 4 | plant > 1.5m tall with > 15 leaves, mature or nearing maturity |
| 5 | plant flowering or seeding |

*Table 4: Condition scores applied to Rusty Plum and Red Bopple Nut.*

| Score | Condition |
|---|---|
| **0** | dead |
| **1** | leafless and no sign of re-shooting |
| **2** | pruned foliage retained, or small amount of re-shooting after defoliating, or foliage sparse/discoloured (<40 cm tall Koala Bells) |
| **3** | vigorous re-shooting (>40 cm tall Koala Bells) |
| **4** | crown recovering, foliage healthy |
| **5** | growing actively, flowering or seeding recorded |

*Table 5: Condition scores applied to Spider Orchid.*

| Score | Condition |
|---|---|
| **0** | dead |
| **1** | pseudobulbs discoloured/grazed/withering, no new growth |
| **2** | pseudobulbs healthy in colour, not withering, no new growth |
| **3** | plant small, not many healthy pseudobulbs, new growth occurring |
| **4** | several healthy pseudobulbs present, new growth occurring |
| **5** | several good sized, healthy pseudobulbs, flowering or seeding recorded |

**Data Analysis**

Monitoring data were stored and processed in Excel™ spreadsheets.

Species survival rate was calculated as:

*(no. of individuals in condition classes 2+3+4+5/total no. plants) X 100*

Species 'thrival' rate (a term used by Ecos Environmental to describe the general trend in vigour of plants in individual sectors or subject to different treatments) was calculated as:

*(number of individuals in condition classes 3+4+5/total no. plants) X 100*

The thrival rate provides, according to Ecos Environmental (2016a) a better indication of the percentage of plants likely to reach reproductive maturity. Mean species height was calculated for all plants including those with zero height (ie plants that had died back to the ground – condition class 1 - not just plants in condition classes 2 to 5).

## YEAR 1 MONITORING RESULTS AND RECOMMENDATIONS

The Year 1 NH2U threatened flora monitoring report (Richards 2017) found that whilst the survival of Slender Marsdenia transplants was comparable to that achieved in other translocation projects, many transplants had died back as a result of a very dry winter-spring in 2017. Furthermore, it was discovered that the Woolls's Tylophora plants were in fact the common *Tylophora paniculata*, and that the Rusty Plum enhancement plantings had been almost entirely lost. Therefore, the following recommendations were made:

1. Discontinue monitoring of *Tylophora paniculata* plants in Sectors G and I in TA1.
2. Direct seed an additional 40 Rusty Plum seeds into Sector E in TA1.
3. Install protective cages on all new and surviving Rusty Plum enhancement plantings.

The direct seeding of Rusty Plum seed, and installation of cages, was undertaken in October 2018 and is described in a separate report (Richards 2018). From 2018 on, Sectors G and I in TA1 will no longer be monitored.

**YEAR 2 MONITORING RESULTS AND RECOMMENDATIONS**

The Year 2 NH2U threatened flora monitoring report (Richards 2018a) found that performance indicators were met for *in situ* plants of Slender Marsdenia and Gully Ironbark, but that Spider Orchid had failed to meet the target for percentage of plants in condition class 3 or better. Results for translocated plants were mixed, with target survival rates after five years not met for Slender Marsdenia, Woolls's Tylophora and Rusty Plum. Recommendations arising from the Year 2 report were:

1. Monitor Rusty Plum enhancement plantings six months after planting (ie April 2019) to assess condition of protective cages, incursion of weeds or competing native species, whether any seeds have germinated, and to undertake any necessary maintenance of the enhancement plantings.
2. Engage a qualified bush regenerator to assess the current level of infestation of Broad-leaved Paspalum and Lantana in TA1, and, if necessary, provide an appropriate control program. Observations by the author during monitoring surveys suggests that both weed species have increased in density in parts of TA1, particularly in the vicinity of old vehicular tracks. Early action to control both species would be beneficial.

As at February 2020, the Year 2 recommendations had not been implemented, due to a lapse in communication between different contractors and TfNSW personnel. An inspection of the weed-affected areas in TA1 was, however, undertaken by a qualified bush regenerator during the Rusty Plum enhancement planting in October 2018. It should be noted that weeds are not directly affecting any translocated plants at present. Recommendations provided in the present report (refer to p.23) account for this oversight and provide appropriate mitigation measures.

**DELAY IN YEAR 3 MONITORING SURVEYS**

Monitoring surveys are usually undertaken during late spring to early summer (October to December). However, the early start to the 2019 bushfire season was accompanied by extended periods of high to extreme fire danger and hazardous levels of bushfire smoke across the NSW mid-north coast from August 2019 to January 2020. This situation compelled the author to postpone field-based surveys until early February 2020, in the interests of workplace health and safety.

## RESULTS – *IN SITU* FLORA MONITORING

Appendix 1 provides full details of the results of the NH2U Year 3 monitoring of all *in situ* flora. A summary of these results is provided below.

### Spider Orchid

The rate of survival of in situ Spider Orchids decreased significantly to 50 (66%) of the original plants recorded in December 2014 (79% of plants recorded in the previous survey in October 2018). 27 plants could not be found during the current survey; 4 plants not found in 2018 were re-found and some individual orchids had died, bringing the potential number of loss or mortality over six years to 26 plants from the original 76. Very few plants bore old inflorescence axes, indicating poor flowering in spring 2019. No seed pods were recorded during the current survey.

Compared to previous surveys at this site, there was a large amount of tree-fall debris present. Most debris came from large senescent wattles (*Acacia maidenii*) which appeared to have fallen recently. This has probably contributed to the high number of plants that were not able to be re-located during the current survey. It is very likely that many of those plants still survive.

Attributes summarised in Table 6 below suggest a general decline in plant condition:

- Survival rate decreased significantly
- Median plant condition declined
- Mean number of pseudobulbs with leaves per plant decreased slightly.
- The number of plants showing new shoot growth decreased slightly.

The only attribute indicating an improvement in plant condition was an increase in mean length of the longest pseudobulb per plant (Table 6).

*Table 6: Summary of monitoring results for in situ Spider Orchids.*

| Attribute | Dec 2014 | Feb 2016 | Feb 2017 | Oct 2017 | Oct 2018 | Feb 2020 |
|---|---|---|---|---|---|---|
| **Total number of living orchid plants (n)** | 76 | 75 | 72 | 67 | 63 | 50 |
| **% survival** | 100 | 99 | 95 | 88 | 83 | 66 |
| **Median condition class of plants** | | | | 3 | 3 | 2 |
| **Mean length of longest pseudobulb** | 5.27±0.86 | 6.46±0.85 | 5.92±0.34 | 4.2±4.1 | 5.07±5.9 | 6.3±5.6 |
| **Mean number of pseudobulbs with leaves per plant** | 2.46±0.43 | 2.92±0.19 | 2.46±0.19 | 3.4±1.8 | 3.5±2.34 | 3.3±1.85 |
| **% of plants with active new shoot growth** | 4.8% | 15.2% | 2.5% | 60% | 55% | 52% |
| **Change in number of pseudobulbs with leaves per plant relative to the year before** | | Dead – 1%<br>decrease – 10%<br>increase – 59%<br>same – 29% | Dead – 2.4%<br>decrease – 24.4%<br>increase – 24.4%<br>same – 48.7% | Dead / not found – 14%<br>decrease – 21%<br>increase – 41%<br>same – 24% | Dead / not found – 17%<br>decrease – 17%<br>increase – 26%<br>same – 11% | Dead / not found – 41%<br>decrease – 15%<br>increase – 17%<br>same – 5% |

The overall trend in the *in situ* Spider Orchid population indicates a decline in plant condition, with a median condition class score of 2. This result is not surprising, as the past three years have been characterised by long periods of above average temperatures and below average rainfall, including severe winter-spring drought in 2017, 2018 and 2019. Despite the adverse weather conditions, it was

noted during the current survey that there were many dozens, if not hundreds, of wild Spider Orchid plants present at this site in addition to the tagged plants. Most plants appeared to be in reasonable to good health. The decline in condition of tagged plants at this site is most likely due to climate-related factors rather than direct or indirect impacts related to the NH2U project.

**Slender Marsdenia**

Of the five *in situ* Slender Marsdenia plants being monitored, one (ML119) had died back, and the remaining sites supported healthy plants, with a median condition class of 3. Site UTW3 (Figure 4), like last year, had three plants recorded close to the flagged survey point. Site UTW4 had two plants recorded this year compared to one last year.

*Figure 4: In situ Slender Marsdenia UTW3 in Feb 2020.*

**Gully Ironbark**

The large Gully Ironbark, *Eucalyptus ancophila*, which occurs on a drainage line in the NH2U road reserve directly opposite TA1, was observed to be in the same fair condition as the previous survey. As this specimen is a very old tree, the crown inevitably displays some signs of senescence.

## RESULTS - TRANSLOCATED FLORA MONITORING

Appendix 2 provides full details of the results of the NH2U Year 3 monitoring of all translocated flora. A summary of these results is provided below. The results of the current season's monitoring of all translocated threatened plants, including all data collected in the field, is also provided as an Excel™ workbook which accompanies this report.

### Slender Marsdenia

Slender Marsdenia was planted in three sectors in TA1:

- Sector A - Directly transplanted from construction footprint with no fertiliser.
- Sector F - Propagated vegetatively and introduced with and without fertiliser.
- Sector J - Propagated from seed and introduced with and without fertiliser.

*Sector A*

Survival rate for all 106 plants in Sector A was 39.6% after six years, a small increase on the previous year (36.8%). Mean plant height decreased slightly, from 40.7cm to 40.4cm. 19 of these plants were a metre or more in height. The percentage of plants with active shoot growth was 33%. 62 plants had died back, and three plants could not be found and have possibly been lost under tree-fall debris. Survival and mean height results recorded during all Sector A surveys are summarised in Table 7 below.

After six years the 'thrival rate' of Slender Marsdenia in Sector A was 25.5% (27 plants out of 106 with a Condition Class score of 3, 4 or 5), a slight decrease from the previous survey rate of 28.3%. No plants were in flower or fruit at the time of survey.

*Table 7: Slender Marsdenia in TA1 Sector A - mean height in centimetres and percent survival of transplants – all surveys.*

| All plants n = 106 | Mar 2014 | Dec 2014 | Jan 2016 | Nov 2016 | Oct 2017 | Nov 2018 | Feb 2020 |
|---|---|---|---|---|---|---|---|
| **Survival %** | 90.5 | 87.6 | 71.2 | 67.9 | 40 | 36.8 | 39.6 |
| **Mean height (cm)** | 36.25 | 36.25 | 42.38 | 39.97 | 36.3 | 40.7 | 40.4 |

*Sector F*

The survival rate of all 90 plants in Sector F was 51.1%, an improvement on the previous survey but lower than previous seasons. Mean plant height was 46.1cm, also an increase on the previous survey. Survival and mean height results recorded during all Sector F surveys are summarised below in Table 8.

The thrival rate after six years was 32.2%, lower than the previous survey rate of 36.7%. 19 plants with a condition class score of 3 or more were more than one metre in height. No plants were in bud, or flowering, at the time of the current survey.

*Table 8: Slender Marsdenia in TA1 Sector F - mean height in centimetres and percent survival of transplants.*

| All plants n = 90 | Jul 2014 | Jan 2016 | Nov 2016 | Oct 2017 | Nov 2018 | Feb 2020 |
|---|---|---|---|---|---|---|
| **Survival %** | 83.63 | 77.1 | 66.75 | 61.1 | 42.2 | 51.1 |
| **Mean height (cm)** | 21.04 | 68.50 | 55.89 | 52.44 | 30.7 | 46.1 |

*Sector J*

103 propagated Slender Marsdenia seedlings were planted in Sector J in August 2014. Results from the current survey reveal an increase in survival rate to 48.5% and mean plant height to 37.2cm since the last monitoring survey (Table 9).

The current thrival rate of Slender Marsdenia in Sector J is 32%, which is the same as the previous year. 14 plants were one metre or more in height. No plants were in flower or fruit.

*Table 9: Slender Marsdenia in TA1 Sector J - mean height in centimetres and percent survival of transplants.*

| All plants n = 103 | Dec 2014 | Jan 2016 | Nov 2016 | Oct 2017 | Nov 2018 | Feb 2020 |
|---|---|---|---|---|---|---|
| **Survival %** | 92.2 | 86.4 | 82.5 | 54.39 | 43.7 | 48.5 |
| **Mean height (cm)** | 46.75 | 69.15 | 64.19 | 54.61 | 32.3 | 37.2 |

**Woolls's Tylophora**

Woolls's Tylophora *Tylophora woollsii* was translocated to TA1 into Sector B as direct transplants from the construction footprint with no fertiliser.

*Sector B*

Mean survival rate for all plants in Sector B for the current survey was 11.9% (5 plants of 42), a slight increase from the previous year. Mean plant height again decreased to 1.6cm (Table 10).

As was the case last season, the strongest indicator of the poor state of plants in this sector is the thrival rate of 0%. No plants were assessed as being in condition class 3 or better. As suggested by Ecos Environmental (2016a), the recipient site, being located on a hill crest and visibly drier and more exposed than other sectors, represents sub-optimal habitat for Woolls's Tylophora and Slender Marsdenia.

As noted in last year's report, several of the living plants observed during the current survey looked more like *Tylophora paniculata* than *T. woollsii*. Until these plants flower, it will be assumed that they all represent *T. woollsii*.

*Table 10: Woolls's Tylophora in TA1 Sector B - mean height in centimetres and percent survival of transplants.*

| All plants n = 42 | Mar 2014 | Dec 2014 | Jan 2016 | Nov 2016 | Oct 2017 | Nov 2018 | Feb 2020 |
|---|---|---|---|---|---|---|---|
| **Survival %** | 90.5 | 80 | 73.8 | 31 | 14.29 | 9.5 | 11.9 |
| **Mean height (cm)** | 76.31 | 38.84 | 34.07 | 11.73 | 4.88 | 2.07 | 1.6 |

**Rusty Plum**

*Translocated Rusty Plums*

Two small Rusty Plum trees (4-8m high) were transplanted into Sector E in TA1. One tree had split and was separated into two pieces (plants 1 and 2) before planting. The other tree (plant 3) was pruned back to remove most of the branch system before being transplanted. Plant 2 died in 2017.

The current survey revealed no losses since the previous survey, with a survival rate of 67%. Plant 1 bore a healthy, basal stem shoot which had increased in size from the previous survey (Figure 5). Plant 3 was in excellent health with a flush of new growth.

*Figure 5: Rusty Plum transplanted tree No. 1 in good health with new growth.*

*Rusty Plum enhancement plantings*

Ecos Environmental (2016a) noted that most of the 40 Rusty Plum seeds planted directly into 20 points within Sector E of TA1 had germinated, but no protective tree guards were installed, resulting in heavy losses to browsing by wallabies and possums. Ten of the direct seeded points (50%) had live Rusty Plum seedlings in January 2016. This number had decreased to six (30%) by Nov 2016, and only three in 2017. During the current survey, only one of the original Rusty Plum enhancement plantings was re-located, a survival rate of 2.5%.

As described in the introductory section of this report, the direct seeding of Rusty Plum seed was repeated, including the installation of tree guards, in October 2018 (Richards 2018). None of the newly direct-planted seeds had survived when re-visited during the current survey. The seeds were planted in cool, moist conditions, but a severe winter-spring drought occurred in 2019. It is likely that the plantings succumbed to the drought conditions.

**Red Bopple Nut**

A single Red Bopple Nut tree was transplanted to Sector H in TA1. The tree was recorded in excellent condition during the current survey. Although it appeared that flowering had failed due to the extremely dry winter-spring, the plant bore new leaf shoots (Figure 6) which probably appeared after heavy rains in January/February 2020. No fruit-set was observed at the time of the survey.

*Figure 6: New leaf shoots on Red Bopple Nut transplant in TA1 Feb 2020*

**Spider Orchid**

Of the 60 Spider Orchid transplants at TA2 recorded in 2016 (Ecos Environmental 2016a), 44 were recorded as alive during the current survey, a survival rate of 73.3%, which represents a slight increase from the previous survey result of 71.7% survival. This figure may underestimate actual survival, as some plants were not able to be re-located during the current survey whilst another six plants that were not located in the 2018 survey were re-found during the current survey.

Along with the slight improvement in survival rate, other results showed an improvement in the population, including an increase in the mean length of the longest pseudobulb; a small increase in mean number of pseudobulbs with leaves per plant, and a significant increase in the number of plants bearing new shoots. Median condition class of the translocated Spider Orchids has remained at 3. This accords with the general impression that the majority of surviving translocated Spider Orchids remain in good health (Figure 7). Several old inflorescence axes were observed during the current survey, indicating that flowering had occurred in the previous spring. However, no evidence of fruit production was recorded. Monitoring results for all translocated Spider Orchid surveys are summarised below in Table 11.

*Figure 7: Spider Orchid transplants 8a and 8b in excellent health, TA2 Feb 2020*

*Table 11: Summary of monitoring results for Spider Orchid transplants at TA2.*

| Attribute | Mar 2014 | Dec 2014 | Jan 2016 | Nov 2016 | Oct 2017 | Nov 2018 | Feb 2020 |
|---|---|---|---|---|---|---|---|
| **Survival (%, n=60)** | 96.4 | 92.7 | 94.6 | 94.6 | 78.3 | 71.7 | 73.3 |
| **Mean length of the longest pseudobulb (cm)** | 8.22 | 8.22 | 8.56 | 8.56 | 6.55 | 7.3 | 8.3 |
| **Mean number of pseudobulbs with leaves** | 1.95 | 1.73 | 2.40 | 2.40 | 2.43 | 2.5 | 2.7 |
| **Number of plants with new shoots (pseudobulbs)** | 1 | 6 | 10 | 10 | 15 | 28 | 35 |

## DISCUSSION

In accordance with the MCoA of the NH2U TFMP (Ecos Environmental 2013), each annual monitoring report must include an assessment of the success or failure of protective measures for *in situ* threatened flora, and an assessment of the success or failure of the threatened flora translocation program (salvage translocation and population enhancement measures). These assessments are provided below. The MCoA also requires a recommended work plan for the next 12 months. This, too, is provided below.

### Evaluation of *in situ* Flora Management

The following performance indicators are used to evaluate the success of protective measures for *in situ* threatened flora:

a) The survival rate of *in situ* threatened flora at the finish of clearing is 100%. No accidental damage occurs during clearing.
b) The survival rate of *in situ* threatened flora at the end of years 1-3 of the monitoring program is at least 80% and at least 70% at the end of years 4-8.
c) Of plants surviving at the end of each year, at least 75% are in good condition – i.e. they have healthy foliage, no sign of die-back or disease and exhibit new shoot growth (Condition Class 3 or better).

Table 12 below summarises how the above performance indicators have been met to date.

*Table 12: Evaluation of performance indicators for in situ flora.*

| Species | 100% survival rate at the finish of clearing. No accidental damage during clearing | 80% survival rate at the end of years 1-3 and at least 70% at the end of years 4-8 | At least 75% of surviving plants are in good condition at each year end (Condition Class 3 or higher) | Performance indicators met? |
|---|---|---|---|---|
| **Spider Orchid** | Y | Y | N (66%) | 2 of 3 |
| **Slender Marsdenia** | Y | Y | Y (80%) | 3 of 3 |
| **Gully Ironbark** | Y | Y | Y | 3 of 3 |

*Spider Orchid*

The current level of survival of *in situ* Spider Orchids is the only performance indicator that has not been met to date. As noted in previous reports, this is possibly because not all surviving plants were re-located during the current survey. The large amount of recent tree fall debris made re-location of flagged plants even more difficult this year. Furthermore, the past three years of the winter-spring period have been extremely warm and dry, which may contribute to a general reduction in plant condition. Taking the above comments into consideration, it is the opinion of the author that the *in situ* Spider Orchid population is generally healthy and will most likely achieve, or come close to achieving, all performance indicators for *in situ* flora.

*Slender Marsdenia*

Slender Marsdenia currently meets all performance indicators for *in situ* flora.

*Gully Ironbark*

Gully Ironbark currently meets all performance indicators for *in situ* flora.

**Evaluation of Flora Translocation Program**

The following performance indicators are used to evaluate the success of the threatened species translocations (salvage translocation and population enhancement):

a) All directly impacted individuals of threatened species were salvaged and relocated to the receival sites.
b) At least 60% of transplant and enhancement individuals are surviving after the first year, 50% after five years and 40% after eight years.
c) At the end of the monitoring program (8 years), at least 50% of surviving individuals have a Condition Class of 3 or higher.

Table 13 below summarises how the above performance indicators have been met to date.

*Table 13: Evaluation of performance indicators for translocated flora.*

| Species | All directly impacted individuals of threatened species were salvaged and relocated to the receival site(s). | At least 60% of transplant and enhancement individuals are surviving after the first year, 50% after five years and 40% after eight years | At the end of the monitoring program (8 years), at least 50% of surviving individuals have a Condition Class of 3 or higher. | Performance indicators met? |
|---|---|---|---|---|
| **Slender Marsdenia** | Y | Y, N, n/a | n/a | 2 of 3 to date |
| **Woolls's Tylophora** | Y | Y, N, n/a | n/a | 2 of 3 to date |
| **Rusty Plum transplants** | Y | Y, N, n/a | n/a | 2 of 3 to date |
| **Rusty Plum enhancement plantings** | n/a | N, n/a, n/a | n/a | 0 of 3 to date |
| **Red Bopple Nut** | Y | Y, Y, n/a | n/a | 2 of 3 to date |
| **Spider Orchid** | Y | Y, Y, n/a | n/a | 2 of 3 to date |

It is clear from Table 13 above that the performance indicators are designed to provide an assessment of translocation success mainly for the latter half of the program (years 5 to 8). Because of this, little can be gleaned from this current assessment, apart from some specific comments below.

*Slender Marsdenia*

The current (Year 6) mean survival rate of all Slender Marsdenia plants stands at 46.4%. Based on the author's knowledge of other translocations of this species, this should be considered a good result. It should also be noted that it is highly likely that a proportion of those Slender Marsdenia plants recorded as having died back are still alive and may resprout in future years. However, successful achievement of the performance indicators for this species is as dependant on climatic factors as much as anything else. Should the region continue to experience severe winter-spring droughts like the past three years, then the survival rate of Slender Marsdenia transplants would be expected to decline as more plants die back in response to dry conditions. On the other hand, should milder conditions prevail then significantly more plants would be expected to produce aerial shoots and be in better overall condition.

*Woolls's Tylophora*

The current (Year 6) mean survival rate of Woolls's Tylophora (plants only within Sector B) stands at 11.9%, with a correspondingly low median condition class score of 1. If this low survival and condition persists, then the translocation of this species will have failed all survival and condition class performance indicators.

*Rusty Plum transplants*

Because all Rusty Plum transplants and half the Rusty Plum enhancement plantings survived through Year 1, at present Rusty Plum meets relevant performance criteria. As at Year 6, Rusty Plum transplant survival is 67%, which, if maintained, will meet ongoing performance criteria.

*Rusty Plum enhancement plantings*

The Rusty Plum enhancement planting survival rate is 2.5%, with all seeds direct-planted in October 2018 failing to survive the winter-spring drought of 2019. It is apparent that these enhancement plantings require ongoing maintenance to assist in their survival in such adverse weather conditions.

*Spider Orchid*

The current (Year 6) survival rate of 73.3% may be an underestimate of the actual rate of survival of Spider Orchid plants at TA2, as explained above. Overall, the translocation of Spider Orchid plants has been successful, and it is expected that performance indicators will be met in the future for this species.

**RECOMMENDED 12 MONTH WORK PLAN**

Recommendations to achieve the principle objectives and performance indicators of the TFMP for *in situ* and translocated flora, along with TfNSW responses, are presented in Table 14.

*Table 14: Year 3 recommended 12 month work plan*

| Rec N$^{o}$ | Recommendation | Transport for NSW Response |
|---|---|---|
| **1** | Cessation of monitoring of all *in situ* plants. After six years of monitoring, it is considered that all extant *in situ* plants are highly likely to survive into the future. | Agree with author's recommendation. EPA have reviewed this recommendation and have endorsed the proposed change to monitoring. Recommendation to be adopted following DPIE approval. |
| **2** | Continue monitoring of all currently monitored sectors and plants in TA1 | Agree with author's recommendation |
| **3** | Repeat the Rusty Plum enhancement planting program. Rather than direct-planting of seeds, it is recommended that collected seeds are germinated and grown on in nursery conditions. Planting of seedlings into TA1 would occur only when weather conditions are favourable. The protective tree guards from the previous attempt in 2018 are already in place within TA1 and can be re-used. The planting should be followed up with regular inspections and hand-watering as required. Proposed methods and timelines are provided in APPENDIX 3 | Agree with author's recommendation to be adopted . EPA have reviewed this recommendation and have endorsed the proposed enhancement planting works. |
| **4** | Implement weed control program in TA1 targeting Broad-leaved Paspalum and Lantana in areas identified by bush regenerator as requiring action. Proposed methods and timelines are provided in APPENDIX 3 | Agree with author's recommendation. EPA have reviewed this recommendation and have endorsed the proposed works. |

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## APPENDIX 1

## Monitoring Results – all *in situ* flora February 2020

### Spider Orchid *in situ*

Note: where more than one plant occurs, the lowest plant is recorded first and the highest plant last. If score is the same for all plants, then only one score is recorded. Some scores are given only for the largest of multiple plants.

| No | Date | No. plants | Cond. | No. pbs | No. pbs | Pbs with | Pb change | longest | length pb | New | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **so-59** | Feb 2020 | 1 | 1 | 3 | 1 | 1 | same | 1 | | n | On Grey Gum sapling. Will vanish when bark shed. |
| **so-61** | Feb 2020 | 2 | 3 | 11 | 3 | 1 | increase | 3 | | y | On Melaleuca styphelioides 5+ plants higher up. |
| | Feb 2020 | | 3 | 5 | 4 | 3 | increase | 2 | | y | |
| **A** | Feb 2020 | 2 | 3 | 5 | 4 | 5 | decrease | 3 | | y | re-found nr so-39 |
| | Feb 2020 | | 2 | 5 | 3 | 4 | increase | 1 | | n | re-found nr so-39 |
| **so-39** | Feb 2020 | 2 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| **so-41** | Feb 2020 | 4 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| **so-40** | Feb 2020 | 2 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| **so-69** | Feb 2020 | 3 | 3 | 9 | 2 | 5 | decrease | 8 | | y | |
| | Feb 2020 | | 3 | 12 | 2 | 4 | decrease | 5 | | y | |
| | Feb 2020 | | 3 | 9 | 3 | 6 | decrease | 2 | | y | |
| **so-70** | Feb 2020 | 1 | 2 | 6 | 2 | 1 | increase | 2 | | n | re-found 2019 - broken stem leaning on debris |
| **B** | Feb 2020 | 2 | 3 | 13 | 2 | 5 | decrease | 4 | | y | |
| | Feb 2020 | | 3 | 7 | 3 | 4 | decrease | 7 | | y | |
| **C** | Feb 2020 | 1 | 2 | 9 | 2 | 3 | decrease | 3 | | n | re-found |
| **D** | Feb 2020 | 0 | 0 | | 0 | | | 0 | | | dead |
| **so-71** | Feb 2020 | 3 | 3 | 5 | 1 | 2 | decrease | 1 | | y | |
| | Feb 2020 | | 3 | 4 | 1 | 3 | decrease | 2 | | y | |
| | Feb 2020 | | 2 | 3 | 1 | 2 | decrease | 5 | | n | |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | gone |
| **so-72** | Feb 2020 | 6 | 2 | 5 | 1 | 1 | | 0 | | | not found |
| | Feb 2020 | | 2 | 5 | 1 | 1 | | 0 | | | not found |
| | Feb 2020 | | 2 | 4 | 2 | 2 | | 0 | | | not found |
| | Feb 2020 | | 3 | 5 | 4 | 4 | | 0 | | | not found |
| | Feb 2020 | | 3 | 9 | 4 | 4 | | 0 | | | not found |
| | Feb 2020 | | 2 | 4 | 3 | 3 | | 0 | | | not found |
| **so-76** | Feb 2020 | 2 | 3 | | | | | 0 | | | re-found |
| **F** | Feb 2020 | 3 | 3 | 6 | 4 | 4 | same | 15 | | y | |
| | Feb 2020 | | 3 | 6 | 4 | 4 | same | 10 | | y | |
| | Feb 2020 | | 4 | 15 | 4 | 4 | same | 31 | | y | |
| **G** | Feb 2020 | 1 | 3 | 6 | 2 | 1 | increase | 1 | | y | |

| No | Date | No. plants | Cond. | No. pbs | No. pbs | Pbs with | Pb change | longest | length pb | New | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **H** | Feb 2020 | 2 | 3 | 7 | 2 | 2 | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | gone |
| **M** | Feb 2020 | 0 | 0 | | 0 | | | 0 | | | not found |
| **N** | Feb 2020 | 0 | 0 | | 0 | | | 0 | | | not found |
| **so-27** | Feb 2020 | 3 | 2 | 10 | 2 | 1 | increase | 1 | | n | |
| | Feb 2020 | | 2 | 10 | 4 | 0 | increase | 2 | | n | |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | gone |
| **so-26** | Feb 2020 | 1 | 1 | 6 | 0 | 3 | decrease | 2.5 | | n | 3 plants on tree - lowest monitored. Shaded by Cissus. |
| **so-22** | Feb 2020 | 1 | 2 | 15 | 8 | 12 | decrease | 1 | | n | many tiny Pbs at base with leaves - some new ones too |
| **O** | Feb 2020 | 2 | 2 | | 0 | | | 0 | | n | Tree fallen. Plants alive but on ground in debris. |
| | Feb 2020 | | 2 | | 0 | | | 0 | | n | |
| **P** | Feb 2020 | 1 | 3 | 8 | 3 | 4 | decrease | 5 | | y | 1 other plant high up on tree |
| **Q** | Feb 2020 | 1 | 3 | 12 | 7 | 6 | increase | 3 | | y | |
| **so-21** | Feb 2020 | 1 | 3 | 13 | 4 | 1 | increase | 28 | | y | May have flowered this season |
| **R** | Feb 2020 | 2 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| **so-19** | Feb 2020 | 1 | 3 | 7 | 6 | 4 | increase | 3 | | y | re-found |
| **so-17** | Feb 2020 | 0 | 0 | | 0 | | | 0 | | | gone |
| **so-16** | Feb 2020 | 1 | 3 | 6 | 3 | 1 | increase | 5 | | y | On broken stem |
| **so-15** | Feb 2020 | 3 | 3 | 8 | 4 | 2 | | 0 | | | |
| | Feb 2020 | | 3 | 9 | 2 | 4 | | 0 | | | |
| | Feb 2020 | | 3 | 9 | 9 | 8 | | 0 | | | |
| **S** | Feb 2020 | 1 | 3 | 10 | 4 | 3 | increase | 3 | | y | 5 plants on dying Mel styphelioides adjacent to so-15. |
| | Feb 2020 | 0 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | 0 | 0 | | 0 | | | 0 | | | not found |
| **so-14** | Feb 2020 | 1 | 2 | 7 | 3 | 1 | increase | 7 | | n | One plant gone. Top of host stem snapped off. |
| **so-12** | Feb 2020 | 2 | 0 | | 0 | | | 0 | | | Both plants now gone |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | gone |
| **so-10** | Feb 2020 | 1 | 3 | 11 | 7 | 5 | increase | 18 | | y | re-found low down on paperbark beneath fallen wattle |
| **so-11** | Feb 2020 | 2 | 2 | 7 | 2 | 1 | increase | 2.5 | | n | |
| | Feb 2020 | | 3 | 10 | 3 | 1 | increase | 6 | | y | |
| **so-6** | Feb 2020 | 2 | 3 | 9 | 2 | 4 | decrease | 12 | | y | |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | gone |
| **so-5** | Feb 2020 | 1 | 0 | | 0 | | | 0 | | | not found |
| **so-4** | Feb 2020 | 1 | 3 | 9 | 4 | 4 | same | 9 | | y | |
| **so-7** | Feb 2020 | 2 | 3 | 7 | 5 | 2 | increase | 6 | | y | |
| | Feb 2020 | | 3 | 8 | 5 | 7 | decrease | 4 | | y | |
| **so-8** | Feb 2020 | 3 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |
| **so-9** | Feb 2020 | 2 | 0 | | 0 | | | 0 | | | not found |
| | Feb 2020 | | 0 | | 0 | | | 0 | | | not found |

## Slender Marsdenia and Gully Ironbark *in situ*

| Site No | Species | Chainage | Date | Condition | Ht (m) | No. lvs | New shoots | Comment 2019 |
|---|---|---|---|---|---|---|---|---|
| **ML 119** | Marsdenia longiloba | 62100 | 18-Feb-20 | 1 | | | | Died back |
| **ML 2010-1** | Marsdenia longiloba | 75000 | 18-Feb-20 | 3 | 0.8 | 11 | y | |
| **ML 2010-3** | Marsdenia longiloba | 75000 | 18-Feb-20 | 2 | 0.6 | 10 | y | Collapsed at base of Forest Oak. |
| **UTW3** | Marsdenia longiloba | 78450 | 18-Feb-20 | 2 | 0.2 | 6 | y | Recent re-shoot of last season 'seedling' |
| **UTW3** | Marsdenia longiloba | 78450 | 18-Feb-20 | 2 | 0.6 | 11 | y | Uphill plant sprawling over litter |
| **UTW4** | Marsdenia longiloba | 78450 | 18-Feb-20 | 3 | 1 | 20 | y | c. 1.5m from bloodwood sapling on Lomandra and leaf litter |
| **UTW4** | Marsdenia longiloba | 78450 | 18-Feb-20 | 4 | 2 | 60 | y | Vigorous vine on broken bloodwood sapling |
| **EA** | Eucalyptus ancophila | 78850 | 19-Feb-20 | 3 | | | | Same as last year. Pointless to monitor. |

## APPENDIX 2

## Monitoring Results – All Translocated Flora February 2020

### Slender Marsdenia - Sector A transplants

| No | Date | Species | Line | Source Label | Condition | No. leaves | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| **1** | Feb-20 | Marslong | L7 east | ML14 | 1 | | 0 | | db. Parsonsia dorrigoensis on cage |
| **2** | | Marslong | L7 | ML2010-2 | 1 | | 0 | | db |
| **3** | | Marslong | L7 | MLN-5 | 1 | | 0 | | db |
| **4** | | Marslong | L7 | ML14A | 1 | | 0 | | db |
| **5** | | Marslong | L7 | ML14A | 1 | | 0 | | db. P. dorrigoensis in cage |
| **6** | | Marslong | L7 | ML14A | 2 | 8 | 60 | n | Probably Tylophora paniculata |
| **7** | | Marslong | L7 | ML13 | 1 | | 0 | | db |
| **8** | | Marslong | L7 | ML14A | 1 | | 0 | | db |
| **9** | | Marslong | L7 | ML11 | 1 | | 0 | | db |
| **10** | | Marslong | L7 | UTW-2 | 1 | | 0 | | db - tree fall debris |
| **11** | | Marslong | L7 | UTW-2 | 1 | | 0 | | db - tree limbs, drought |
| **12** | | Marslong | L7 | TWN-1 | 1 | | 0 | | db |
| **13** | | Marslong | L7 | UTW-2 | 2 | 6 | 60 | y | resprout recent shoot |
| **14** | | Marslong | L7 | ML20 | 3 | 9 | 80 | y | resprout |
| **15** | | Marslong | L7 | ML21 | 2 | 6 | 50 | n | resprout |
| **16** | | Marslong | L7 | TWN-1 | 0 | | 0 | | gone |
| **17** | | Marslong | L7 | UTW-2 | 1 | | 0 | | db |
| **18** | | Marslong | L7 | UTW-2 | 3 | 8 | 80 | y | |
| **19** | | Marslong | L7 | UTW-1 | 2 | 4 | 20 | y | |
| **20** | | Marslong | L7 west | UTW-4 | 1 | | 0 | | db |
| **21** | | Marslong | L6 west | TWN-1 | 2 | 4 | 70 | n | |
| **22** | | Marslong | L6 | TWN-1 | 2 | 4 | 10 | n | |
| **23** | | Marslong | L6 | TWN-1 | 1 | | 0 | | db |
| **24** | | Marslong | L6 | TWN-1 | 1 | | 0 | | db |
| **25** | | Marslong | L6 | UML-6 | 3 | 3 | 120 | y | |
| **26** | | Marslong | L6 | UML-6 | 2 | 7 | 60 | y | |
| **27** | | Marslong | L6 | MLN-6 | 3 | 5 | 80 | y | |
| **28** | | Marslong | L6 | UML-5 | 1 | | 0 | | db |
| **28b/41** | | Marslong | L6 | UML-5 | 1 | | 0 | | db |
| **29** | | Marslong | L6 | ML17 | 1 | | 0 | | db |
| **30** | | Marslong | L6 | new near ML18 | 4 | 32 | 200 | y | on Cryptocarya rigida |
| **30b/42** | | Marslong | L6 | UML-5 | 3 | 14 | 100 | y | |
| **31** | | Marslong | L6 | new near ML18 | 1 | | 0 | | db |
| **32** | | Marslong | L6 | MLN-6 | 3 | 6 | 120 | y | |
| **33** | | Marslong | L6 | ML18 | 1 | | 0 | | db |
| **33b/40** | | Marslong | L6 | ML21 | 0 | | 0 | | gone |

| No | Date | Species | Line | Source Label | Condition | No. leaves | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| **34** | | Marslong | L6 | ML18 | 1 | | 0 | | db |
| **35** | | Marslong | L6 | MLN6 | 3 | 6 | 240 | y | Climbing Cryptocarya rigida |
| **36** | | Marslong | L6 | ML19 | 4 | 33 | 160 | y | Climbing Cryptocarya rigida |
| **37** | | Marslong | L6 | ML19 | 4 | 52 | 200 | y | Climbing dead sapling |
| **38** | | Marslong | L6 | ML20 | 1 | | 0 | | db |
| **39** | | Marslong | L6 east | ML21 | 2 | 5 | 30 | y | recent shoot |
| **43** | | Marslong | L5 | ML18 | 1 | | 0 | | db |
| **44** | | Marslong | L5 | ML30 | 1 | | 0 | | db |
| **45** | | Marslong | L5 | TW29 | 3 | 4 | 80 | y | resprout |
| **46** | | Marslong | L5 | ML32 | 1 | | 0 | | db |
| **47** | | Marslong | L5 | new adj. ML33 | 2 | 4 | 5 | n | resprout |
| **48** | | Marslong | L5 | new adj. ML33 | 1 | | 0 | | db |
| **49** | | Marslong | L5 | new adj. ML33 | 1 | | 0 | | db |
| **50** | | Marslong | L5 | MLN-2 | 4 | 60 | 400 | y | On Cryptocarya rigida |
| **51** | | Marslong | L5 | ML15 | 2 | 5 | 50 | n | |
| **52** | | Marslong | L5 | ML15 | 1 | | 0 | | db |
| **53** | | Marslong | L5 | new adj. ML33 | 1 | | 0 | | db |
| **54** | | Marslong | L5 | new adj. ML33 | 3 | 14 | 120 | y | |
| **55** | | Marslong | L5 | new adj. ML33 | 1 | | 0 | | db |
| **56** | | Marslong | L5 | new adj. ML33 | 3 | 6 | 110 | y | db |
| **57** | | Marslong | L5 | new adj. ML33 | 1 | | 0 | | db |
| **58** | | Marslong | L5 | ML45- | 1 | | 0 | | db |
| **59** | | Marslong | L5 | ML45-11 | 2 | 8 | 70 | y | T. paniculata - recent resprout |
| **60** | | Marslong | L5 | ML47-1 | 1 | | 0 | | db |
| **61** | | Marslong | L5 | ML47-2 | 1 | | 0 | | db |
| **62** | | Marslong | L5 | ML45-4 | 1 | | 0 | | db |
| **63** | | Marslong | L5 west | ML45- | 1 | | 0 | | db |
| **106** | | Marslong | L4 | ML2010-3 | 1 | | 0 | | db |
| **107** | | Marslong | L4 | ML2010-3 | 3 | 8 | 80 | y | |
| **108** | | Marslong | L4 | ML2010-3 | 2 | 9 | 30 | y | resprout |
| **109** | | Marslong | L4 | MLN-4 | 1 | | 0 | | db |
| **110** | | Marslong | L4 | ML126 | 4 | 28 | 140 | y | |
| **111** | | Marslong | L4 | ML126 | 2 | 5 | 50 | y | |
| **112** | | Marslong | L4 | ML127 | 3 | 8 | 110 | y | |
| **113** | | Marslong | L4 | ML2010-3 | 1 | | 0 | | db |
| **114** | | Marslong | L4 | ML2010-3 | 3 | 7 | 90 | y | |
| **115** | | Marslong | L4 | ML2010-3 | 1 | | 0 | | db |
| **116** | | Marslong | L4 | ML127 | 1 | | 0 | | db |
| **117** | | Marslong | L4 | MLN-3 | 3 | 8 | 80 | y | |
| **118** | | Marslong | L4 | MLN-3 | 3 | 8 | 90 | y | resprout |
| **119** | | Marslong | L4 | MLN-3 | 1 | | 0 | | db |
| **120** | | Marslong | L4 | MLN-3 | 3 | 6 | 120 | y | |

| No | Date | Species | Line | Source Label | Condition | No. leaves | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| **121** | | Marslong | L4 | ML2010-4 | 3 | 10 | 120 | y | resprout |
| **122** | | Marslong | L4 | ML2010-4 | 2 | 3 | 5 | y | resprout |
| **123** | | Marslong | L4 | MLN-4 | 3 | 12 | 120 | y | |
| **124** | | Marslong | L4 | MLN-4 | 3 | 6 | 110 | y | |
| **125** | | Marslong | L4 | TWN-2 | 1 | | 0 | | db |
| **126** | | Marslong | L4 | TWN-2 | 1 | | 0 | | db |
| **127** | | Marslong | L4 | TWN-2 | 1 | | 0 | | db |
| **128** | | Marslong | L3 | MLN-4 | 3 | 12 | 100 | y | |
| **129** | | Marslong | L3 | MLN-4 | 1 | | 0 | | db |
| **130** | | Marslong | L3 | MLN-4 | 3 | 5 | 240 | y | new shoot |
| **131** | | Marslong | L3 | MLN-4 | 1 | | 0 | | db |
| **132** | | Marslong | L3 | MLN-3 | 2 | 6 | 40 | n | |
| **133** | | Marslong | L3 | MLN-3 | 1 | | 0 | | db |
| **134** | | Marslong | L3 | MLN-3 | 1 | | 0 | | db |
| **135** | | Marslong | L3 | ML3 | 1 | | 0 | | db |
| **136** | | Marslong | L3 | ML3 | 1 | | 0 | | db |
| **137** | | Marslong | L3 | ML3 | 3 | 24 | 180 | y | good condition |
| **138** | | Marslong | L3 | ML3 | 1 | | 0 | | db |
| **139** | | Marslong | L3 | ML3 | 1 | | 0 | | db recent tree fall |
| **140** | | Marslong | L3 | ML2 | 1 | | 0 | | under tree fall |
| **141** | | Marslong | L3 | ML2 | 1 | | 0 | | db - cage collapsed |
| **142** | | Marslong | L3 | ML3 | 1 | | 0 | | db |
| **143** | | Marslong | L3 | ML3 | 1 | | 0 | | db |
| **144** | | Marslong | L3 | UTW10 | 1 | | 0 | | db |
| **145** | | Marslong | L3 | UTW10 | 1 | | 0 | | db |
| **146** | | Marslong | L3 | UML8 | 1 | | 0 | | db |
| **147** | | Marslong | L3 | ML3 | 1 | | 0 | | db |
| **148** | | Marslong | L3 | ML3 | 1 | | 0 | | db - cage crushed tree fall |

## Slender Marsdenia - Sector F transplants

| No | Species | Line | Date | Cond. | No. leaves | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|
| **F1** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F2** | Marslong | Line 1 fert | | 3 | 20 | 90 | y | |
| **F3** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F4** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F5** | Marslong | Line 1 fert | | 3 | 19 | 130 | y | |
| **F6** | Marslong | Line 1 fert | | 3 | 4 | 80 | y | |
| **F7** | Marslong | Line 1 fert | | 2 | 4 | 60 | y | looking better than last survey |
| **F8** | Marslong | Line 1 fert | | 1 | | 0 | | db |

| No | Species | Line | Date | Cond. | No. leaves | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|
| **F9** | Marslong | Line 1 fert | | 3 | 9 | 80 | y | resprout |
| **F10** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F11** | Marslong | Line 1 fert | | 2 | 6 | 20 | y | resprout cage crushed by tree fall |
| **F12** | Marslong | Line 1 fert | | 2 | 2 | 50 | y | under tree fall |
| **F13** | Marslong | Line 1 fert | | 4 | 20 | 190 | y | on Cordyline stricta |
| **F14** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F15** | Marslong | Line 1 fert | | 2 | 2 | 40 | y | resprout |
| **F16** | Marslong | Line 1 fert | | 2 | 5 | 30 | y | resprout |
| **F17** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F18** | Marslong | Line 1 fert | | 1 | | 0 | | db |
| **F19** | Marslong | Line 1 fert | | 1 | | 0 | | db - under tree fall debris |
| **F20** | Marslong | Line 1 fert | | 2 | 2 | 70 | n | |
| **F21** | Marslong | Line 1 fert | | 2 | 6 | 40 | y | resprout |
| **F22** | Marslong | Line 1 fert | | 2 | 8 | 70 | n | resprout |
| **NF23** | Marslong | Line 2 no fert | | 3 | 9 | 100 | y | |
| **NF24** | Marslong | Line 2 no fert | | 3 | 6 | 90 | y | |
| **NF25** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF26** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF27** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF28** | Marslong | Line 2 no fert | | 4 | 16 | 170 | y | |
| **NF29** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF30** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF31** | Marslong | Line 2 no fert | | 2 | 2 | 25 | y | |
| **NF32** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF33** | Marslong | Line 2 no fert | | 1 | | 0 | | db - under dense Cissus hypoglauca |
| **NF34** | Marslong | Line 2 no fert | | 3 | 8 | 90 | y | |
| **NF35** | Marslong | Line 2 no fert | | 2 | 6 | 50 | y | reshooting |
| **NF36** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF37** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF38** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF39** | Marslong | Line 2 no fert | | 3 | 13 | 110 | y | on cage and dead limb |
| **NF40** | Marslong | Line 2 no fert | | 1 | | 0 | | db - cage knocked over |
| **NF41** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF42** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF43** | Marslong | Line 2 no fert | | 1 | | 0 | | db |
| **NF44** | Marslong | Line 2 no fert | | 2 | 6 | 10 | n | |
| **NF44a** | Marslong | Line 2 no fert | | 2 | 5 | 15 | y | resprout |
| **NF44b** | Marslong | Line 2 no fert | | 3 | 4 | 120 | y | |
| **F45** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F46** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F47** | Marslong | Line 3 fert | | 2 | 9 | 30 | n | resprout |
| **F48** | Marslong | Line 3 fert | | 3 | 23 | 120 | y | |

| No | Species | Line | Date | Cond. | No. leaves | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|
| **F49** | Marslong | Line 3 fert | | 2 | 4 | 8 | n | resprout |
| **F50** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F51** | Marslong | Line 3 fert | | 2 | 2 | 35 | n | yellowed leaves |
| **F52** | Marslong | Line 3 fert | | 3 | 8 | 80 | y | |
| **F53** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F54** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F55** | Marslong | Line 3 fert | | 3 | 10 | 95 | y | on Tabernaemontana. Good condition |
| **F56** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F57** | Marslong | Line 3 fert | | 3 | 8 | 110 | y | |
| **F58** | Marslong | Line 3 fert | | 4 | 15 | 190 | y | Under tree fall debris |
| **F59** | Marslong | Line 3 fert | | 3 | 10 | 140 | y | |
| **F60** | Marslong | Line 3 fert | | 3 | 5 | 90 | y | fair cond |
| **F61** | Marslong | Line 3 fert | | 3 | 9 | 110 | y | |
| **F62** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F63** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F64** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F65** | Marslong | Line 3 fert | | 1 | | 0 | | db |
| **F66** | Marslong | Line 3 fert | | 2 | 4 | 40 | n | |
| **NF67** | Marslong | Line 4 no fert | | 4 | 22 | 200 | y | Growing up Gynocthodes (Morinda) |
| **NF68** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF69** | Marslong | Line 4 no fert | | 3 | 15 | 110 | y | |
| **NF70** | Marslong | Line 4 no fert | | 4 | 22 | 210 | y | on small dead shrub and Trochocarpa laurina |
| **NF71** | Marslong | Line 4 no fert | | 3 | 10 | 95 | y | resprout |
| **NF72** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF73** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF74** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF75** | Marslong | Line 4 no fert | | 3 | 4 | 120 | y | |
| **NF76** | Marslong | Line 4 no fert | | 3 | 10 | 90 | y | |
| **NF77** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF78** | Marslong | Line 4 no fert | | 3 | 10 | 130 | y | |
| **NF79** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF80** | Marslong | Line 4 no fert | | 3 | 16 | 100 | y | on Tabernaemontana. |
| **NF81** | Marslong | Line 4 no fert | | 2 | 4 | 70 | n | |
| **NF82** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF83** | Marslong | Line 4 no fert | | 3 | 7 | 130 | y | |
| **NF84** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF85** | Marslong | Line 4 no fert | | 3 | 11 | 120 | y | |
| **NF86** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF87** | Marslong | Line 4 no fert | | 1 | | 0 | | db |
| **NF88** | Marslong | Line 4 no fert | | 0 | | 0 | | gone |

## Slender Marsdenia - Sector J transplants

| Monit. No. | | Species | Line | Fertiliser | Date | Cond | No. Lvs | Ht (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | **1** | Marslong | L1 | no fert | 22-Feb-20 | 3 | 9 | 100 | y | |
| | **2** | Marslong | L1 | no fert | 22-Feb-20 | 3 | 11 | 90 | y | |
| | **3** | Marslong | L1 | no fert | | 3 | 15 | 100 | y | |
| | **4** | Marslong | L1 | no fert | | 4 | 38 | 150 | y | |
| | **5** | Marslong | L1 | no fert | | 3 | 15 | 130 | y | |
| | **6** | Marslong | L1 | no fert | | 3 | 15 | 115 | y | |
| | **7** | Marslong | L1 | no fert | | 3 | 6 | 80 | y | |
| | **8** | Marslong | L1 | no fert | | 2 | 1 | 80 | y | only just shooting |
| | **9** | Marslong | L1 | no fert | | 3 | 17 | 110 | y | on Morinda and Endiandra sieberi |
| | **10** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **11** | Marslong | L1 | no fert | | 3 | 11 | 90 | y | |
| | **12** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **13** | Marslong | L1 | no fert | | 3 | 8 | 75 | y | |
| | **14** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **15** | Marslong | L1 | no fert | | 2 | 8 | 15 | y | just resprouting |
| | **16** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **17** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **18** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **19** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **20** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **21** | Marslong | L1 | no fert | | 1 | | 0 | | db - under tree fall debris |
| | **22** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **23** | Marslong | L1 | no fert | | 1 | | 0 | | db |
| | **24** | Marslong | L1 | no fert | | 2 | 6 | 70 | n | just resprouting |
| | **25** | Marslong | L1 | no fert | | 2 | 3 | 5 | n | |
| **Line 2** | **1** | Marslong | L2 | fert | | 3 | 15 | 95 | y | |
| | **2** | Marslong | L2 | fert | | 3 | 16 | 105 | y | |
| | **3** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **4** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **5** | Marslong | L2 | fert | | 3 | 6 | 95 | y | |
| | **6** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **7** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **8** | Marslong | L2 | fert | | 3 | 16 | 80 | y | |
| | **9** | Marslong | L2 | fert | | 3 | 28 | 70 | y | good health despite sapling fallen on cage |
| | **10** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **11** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **12** | Marslong | L2 | fert | | 3 | 9 | 95 | y | |
| | **13** | Marslong | L2 | fert | | 2 | 6 | 8 | y | reshooting at ground level |
| | **14** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **15** | Marslong | L2 | fert | | 3 | 10 | 70 | y | |
| | **16** | Marslong | L2 | fert | | 3 | 6 | 100 | y | |

| Monit. No. | | Species | Line | Fertiliser | Date | Cond | No. Lvs | Ht (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| | **17** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **18** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **19** | Marslong | L2 | fert | | 2 | 4 | 5 | n | |
| | **20** | Marslong | L2 | fert | | 3 | 10 | 100 | y | |
| | **21** | Marslong | L2 | fert | | 2 | 2 | 50 | y | |
| | **22** | Marslong | L2 | fert | | 1 | | 0 | | db - under pile of Cissus and Melodinus |
| | **23** | Marslong | L2 | fert | | 3 | 5 | 90 | y | resprout |
| | **24** | Marslong | L2 | fert | | 1 | | 0 | | db |
| | **25** | Marslong | L2 | fert | | 3 | 14 | 80 | y | |
| **Line 3** | **1** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **2** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **3** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **4** | Marslong | L3 | no fert | | 3 | 7 | 110 | y | growing up Cordyline stricta |
| | **5** | Marslong | L3 | no fert | | 3 | 13 | 100 | y | |
| | **6** | Marslong | L3 | no fert | | 3 | 17 | 90 | y | on Ripogonum fawcettianum |
| | **7** | Marslong | L3 | no fert | | 3 | 9 | 80 | y | |
| | **8** | Marslong | L3 | no fert | | 2 | 4 | 20 | y | |
| | **9** | Marslong | L3 | no fert | | 3 | 22 | 130 | y | wild Marsdenia longiloba also present |
| | **10** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **11** | Marslong | L3 | no fert | | 2 | 6 | 25 | y | |
| | **12** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **13** | Marslong | L3 | no fert | | 2 | 2 | 10 | n | |
| | **14** | Marslong | L3 | no fert | | 2 | 6 | 60 | y | |
| | **15** | Marslong | L3 | no fert | | 2 | 4 | 5 | n | |
| | **16** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **17** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **18** | Marslong | L3 | no fert | | 3 | 6 | 80 | y | |
| | **19** | Marslong | L3 | no fert | | 3 | 12 | 90 | y | |
| | **20** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **21** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **22** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **23** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **24** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **25** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **26** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| | **27** | Marslong | L3 | no fert | | 1 | | 0 | | db |
| **Line 4** | **1** | Marslong | L4 | fert | | 3 | 9 | 95 | y | |
| | **2** | Marslong | L4 | fert | | 3 | 5 | 80 | y | |
| | **3** | Marslong | L4 | fert | | 2 | 3 | 60 | n | |
| | **4** | Marslong | L4 | fert | | 2 | 4 | 50 | n | |
| | **5** | Marslong | L4 | fert | | 1 | | 0 | | db - east side of creekline |
| | **6** | Marslong | L4 | fert | | 1 | | 0 | | db |

| Monit. No. | Species | Line | Fertiliser | Date | Cond | No. Lvs | Ht (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| **7** | Marslong | L4 | fert | | 2 | 8 | 60 | y | |
| **8** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **9** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **10** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **11** | Marslong | L4 | fert | | 3 | 11 | 150 | y | |
| **12** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **13** | Marslong | L4 | fert | | 2 | 6 | 50 | y | |
| **14** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **15** | Marslong | L4 | fert | | 3 | 6 | 80 | y | |
| **16** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **17** | Marslong | L4 | fert | | 3 | 19 | 105 | y | |
| **18** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **19** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **20** | Marslong | L4 | fert | | 2 | 10 | 50 | y | |
| **21** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **22** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **23** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **24** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **25** | Marslong | L4 | fert | | 1 | | 0 | | db |
| **26** | Marslong | L4 | fert | | 1 | | 0 | | db - under fallen Forest Oak |

## Woolls's Tylophora - Sector B transplants

| No | Date | Line | Tentative Species ID | Source Label | Cond | No. lvs | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| **64** | Feb-20 | L8 east, gate | Tylophora woollsii | ML46-6 | 1 | | 0 | | db |
| **65** | Feb-20 | L8 | Tylophora woollsii | ML46- | 1 | | 0 | | db |
| **66** | Feb-20 | L8 | Tylophora woollsii | ML48-5 | 1 | | 0 | | db |
| **67** | Feb-20 | L8 | Tylophora woollsii | ML46-1 | 1 | | 0 | | db. P. dorrigoensis on cage |
| **68** | Feb-20 | L8 | Tylophora woollsii | ML46 | 1 | | 0 | | db |
| **69** | Feb-20 | L8 | Tylophora woollsii | ML46- | 1 | | 0 | | db |
| **70** | Feb-20 | L8 | Tylophora woollsii | ML46-3 | 1 | | 0 | | db |
| **71** | Feb-20 | L8 | Tylophora woollsii | ML46-2 | 1 | | 0 | | db |
| **72** | Feb-20 | L8 | Tylophora woollsii | ML47-3 | 1 | | 0 | | db |
| **73** | Feb-20 | L8 | Tylophora woollsii | ML47-10 | 1 | | 0 | | db |
| **74** | Feb-20 | L8 | Tylophora woollsii | ML46-6 | 1 | | 0 | | db |
| **75** | Feb-20 | L8 | Tylophora woollsii | ML47-4 | 1 | | 0 | | db |
| **76** | Feb-20 | L8 | Tylophora woollsii | ML48 | 1 | | 0 | | db |
| **77** | Feb-20 | L8 | Tylophora woollsii | ML48-2 | 1 | | 0 | | db |
| **78** | Feb-20 | L8 | Tylophora woollsii | ML47-5 | 1 | | 0 | | db |
| **79** | Feb-20 | L8 | Tylophora woollsii | ML46-4 | 1 | | 0 | | db |

| No | Date | Line | Tentative Species ID | Source Label | Cond | No. lvs | Height (cm) | New Shoots (Y/N) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| **80** | Feb-20 | L8 | Tylophora woollsii | ML47-6 | 1 | | 0 | | db |
| **81** | Feb-20 | L8 | Tylophora woollsii | new near TA | 1 | | 0 | | db |
| **82** | Feb-20 | L8 | Tylophora woollsii | new near TA | 1 | | 0 | | db |
| **83** | Feb-20 | L8 | Tylophora woollsii | ML45-3 | 2 | 4 | 7 | y | T. paniculata? Very narrow leaves |
| **84** | Feb-20 | L8 | Tylophora woollsii | ML45-2 | 1 | | 0 | | db |
| **85** | Feb-20 | L9 | Tylophora woollsii | ML45-6 | 1 | | 0 | | db |
| **86** | Feb-20 | L9 | Tylophora woollsii | ML45-10 | 1 | | 0 | | db |
| **87** | Feb-20 | L9 | Tylophora woollsii | ML45-4 | 2 | 8 | 30 | y | resprout |
| **88** | Feb-20 | L9 | Tylophora woollsii | ML48-4 | 1 | | 0 | | db |
| **89** | Feb-20 | L9 | Tylophora woollsii | ML47-8 | 1 | | 0 | | db |
| **90** | Feb-20 | L9 | Tylophora woollsii | ML46-7 | 1 | | 0 | | db |
| **91** | Feb-20 | L9 | Tylophora woollsii | ML47-7 | 2 | 4 | 10 | y | resprout |
| **92** | Feb-20 | L9 | Tylophora woollsii | ML48-1 | 1 | | 0 | | db |
| **93** | Feb-20 | L9 | Tylophora woollsii | ML48-5 | 1 | | 0 | | db |
| **94** | Feb-20 | L9 | Tylophora woollsii | ML48-7 | 1 | | 0 | | db |
| **95** | Feb-20 | L9 | Tylophora woollsii | ML48-4 | 1 | | 0 | | db |
| **96** | Feb-20 | L9 | Tylophora woollsii | ML | 1 | | 0 | | db |
| **97** | Feb-20 | L9 | Tylophora woollsii | ML47-9 | 2 | 4 | 10 | y | resprout - T. paniculata? |
| **98** | Feb-20 | L9 | Tylophora woollsii | ML48-7 | 2 | 6 | 10 | y | resprout |
| **99** | Feb-20 | L9 | Tylophora woollsii | ML48 | 1 | | 0 | | db |
| **100** | Feb-20 | L9 | Tylophora woollsii | ML47-10 | 1 | | 0 | | db |
| **101** | Feb-20 | L9 | Tylophora woollsii | ML45-5 | 1 | | 0 | | db |
| **102** | Feb-20 | L9 | Tylophora woollsii | ML45-8 | 1 | | 0 | | db |
| **103** | Feb-20 | L9 | Tylophora woollsii | ML48-9 | 1 | | 0 | | db |
| **104** | Feb-20 | L9 | Tylophora woollsii | ML48-1 | 1 | | 0 | | db |
| **105** | Feb-20 | L9 | Tylophora woollsii | ML48-8 | 1 | | 0 | | db |

## Rusty Plum & Red Bopple Nut transplants

| Monitoring Number | Condition notes | Condition Score | Height (m) | Comments |
|---|---|---|---|---|
| **Rusty Plum 1** | split one from Boggy Creek shooting | 4 | 0.9 | In excellent health. One shoot from base of main stem |
| **Rusty Plum 2** | split one from Boggy Creek shooting | 0 | 0 | dead |
| **Rusty Plum 3** | good - lot of new shoots | 4 | 3.7 | In excellent health |
| **Red Bopple Nut** | Good health - new leaves appearing post-rain. | 3 | 3.1 | Flowering failed due to drought conditions. New growth after heavy rain Feb 2020. |

## Rusty Plum Enhancement Plantings

| Monitoring No | Date planted | Easting | Northing | Condition Feb 2020 | Notes |
|---|---|---|---|---|---|
| **NW1** | 22-Oct-18 | n/a | n/a | Cage not re-located | |
| **NW2** | 22-Oct-18 | 497848 | 6626467 | Gone | killed by drought |
| **NW3** | 22-Oct-18 | 497842 | 6626468 | Gone | killed by drought |
| **NW4** | 22-Oct-18 | 497847 | 6626456 | Gone | killed by drought |
| **NW5** | 22-Oct-18 | 497846 | 6626452 | Gone | killed by drought |
| **NW6** | 22-Oct-18 | 497848 | 6626445 | Gone | killed by drought |
| **NW7** | 22-Oct-18 | 497847 | 6626444 | Gone | killed by drought |
| **NW8** | 22-Oct-18 | 497847 | 6626443 | Gone | killed by drought |
| **NW9** | 22-Oct-18 | 497848 | 6626444 | Gone | killed by drought |
| **NW10** | 22-Oct-18 | 497843 | 6626441 | Gone | killed by drought |
| **NW11** | 22-Oct-18 | 497839 | 6626434 | Gone | killed by drought |
| **NW12** | 22-Oct-18 | 497839 | 6626433 | Gone | killed by drought |
| **NW13** | 22-Oct-18 | 497847 | 6626424 | Gone | killed by drought |
| **NW14** | 22-Oct-18 | 497847 | 6626424 | Gone | killed by drought |
| **NW15** | 22-Oct-18 | 49784 | 6626427 | Gone | killed by drought |
| **NW16** | 22-Oct-18 | 497847 | 6626428 | Gone | killed by drought |
| **NW17** | 22-Oct-18 | 497840 | 6626419 | Gone | killed by drought |
| **NW18** | 22-Oct-18 | 497839 | 6626419 | Gone | killed by drought |
| **NW19** | 22-Oct-18 | 497838 | 6626414 | Gone | killed by drought |
| **NW20** | 22-Oct-18 | 497838 | 6626418 | Gone | killed by drought |

## Spider Orchid transplants – TA2

| No | Date | Source Label | Species | Cond 2019 | pb with lvs | Longest pb | New growth active | notes |
|---|---|---|---|---|---|---|---|---|
| **2** | Feb-20 | so-87 | Dendmela | 4 | 9 | 17 | y | wired to fallen Swamp Oak limb |
| **3** | Feb-20 | so-74 | Dendmela | 3 | 5 | 6 | y | |
| **4** | Feb-20 | so-26b | Dendmela | 0 | 0 | 0 | | gone |
| **5** | Feb-20 | so-48 | Dendmela | 4 | 3 | 19 | y | re-found near 7 |
| **6** | Feb-20 | so-52 | Dendmela | 3 | 4 | 8 | y | adjacent to 7 |
| **7a (bottom)** | Feb-20 | so-36 | Dendmela | 3 | 4 | 6 | y | |
| **7b (top)** | Feb-20 | so-36 | Dendmela | 4 | 6 | 38 | y | |
| **8a (left)** | Feb-20 | so-62 | Dendmela | 4 | 6 | 28 | y | |
| **8b (right)** | Feb-20 | so-62 | Dendmela | 4 | 9 | 40 | y | |
| **9** | Feb-20 | so-25 | Dendmela | 0 | 0 | 0 | | dead |
| **10** | Feb-20 | so-24 | Dendmela | 1 | 1 | 1 | n | |
| **11a** | Feb-20 | so-29 | Dendmela | 3 | 2 | 9 | y | |
| **11b** | Feb-20 | so-29 | Dendmela | 3 | 3 | 2 | y | |
| **11c** | Feb-20 | so-29 | Dendmela | 0 | 0 | 0 | dead | dead |
| **12** | Feb-20 | so-65 | Dendmela | 4 | 4 | 26 | y | Well away from other plants in SE corner |
| **13** | Feb-20 | so-64 | Dendmela | 3 | 4 | 12 | y | |
| **14** | Feb-20 | so-28 | Dendmela | 3 | 2 | 9 | y | |
| **15** | Feb-20 | so-24 | Dendmela | 3 | 4 | 10 | y | |
| **16** | Feb-20 | so-53 | Dendmela | 3 | 2 | 8 | y | |
| **17** | Feb-20 | so-26b | Dendmela | 4 | 3 | 27 | y | re-found |
| **18** | Feb-20 | so-23 | Dendmela | 0 | 0 | 0 | gone | gone |
| **19** | Feb-20 | so-88 | Dendmela | 4 | 11 | 36 | y | excellent condition |
| **20** | Feb-20 | so-86 | Dendmela | 3 | 3 | 10 | y | newest pb damaged |
| **21** | Feb-20 | so-86-1 | Dendmela | 2 | 2 | 14 | n | adjacent to 22 |
| **22** | Feb-20 | so-35 | Dendmela | 4 | 9 | 31 | y | v healthy - pic |
| **23a (bottom)** | Feb-20 | so-86- | Dendmela | 0 | 0 | 0 | | tiny plant -gone 2020 |
| **23b (top)** | Feb-20 | so-86- | Dendmela | 0 | 0 | 0 | | tiny plant -gone 2020 |
| **24** | Feb-20 | so-86-3 | Dendmela | 3 | 3 | 2 | y | |
| **25** | Feb-20 | so-86-4 | Dendmela | 2 | 1 | 1 | n | re-found |
| **26** | Feb-20 | so-43 | Dendmela | 0 | 0 | 0 | gone | gone |
| **27** | Feb-20 | so-67 | Dendmela | 0 | 0 | 0 | gone | gone |
| **28** | Feb-20 | so-68 | Dendmela | 4 | 3 | 35 | y | |
| **29a (bottom)** | Feb-20 | so-2 | Dendmela | 3 | 4 | 4 | y | re-found |
| **29b** | Feb-20 | so-2 | Dendmela | 4 | 10 | 31 | y | re-found |
| **29c (top)** | Feb-20 | so-2 | Dendmela | 2 | 3 | 1 | n | re-found |
| **30** | Feb-20 | so-57 | Dendmela | 3 | 2 | 1.5 | y | |
| **31** | Feb-20 | so-30 | Dendmela | 3 | 3 | 4 | y | |
| **32** | Feb-20 | so-82 | Dendmela | 3 | 3 | 2 | y | |
| **33** | Feb-20 | so-66 | Dendmela | 3 | 4 | 7 | y | |
| **34** | Feb-20 | so-38 | Dendmela | 2 | 1 | 4 | n | |
| **35** | Feb-20 | so-86-13 | Dendmela | 0 | 0 | 0 | gone | gone |

| No | Date | Source Label | Species | Cond 2019 | pb with lvs | Longest pb | New growth active | notes |
|---|---|---|---|---|---|---|---|---|
| **36** | Feb-20 | so-82 | Dendmela | 2 | 1 | 1.5 | n | |
| **37** | Feb-20 | so-86-5 | Dendmela | 0 | 0 | 0 | | dead |
| **38** | Feb-20 | Dm34a | Dendmela | 3 | 2 | 6 | y | |
| **39** | Feb-20 | so-86-12 | Dendmela | 4 | 2 | 26 | y | |
| **40** | Feb-20 | so-86-6 | Dendmela | 2 | 2 | 1 | n | |
| **41** | Feb-20 | so-86-7 | Dendmela | 0 | 0 | 0 | | gone |
| **42** | Feb-20 | no label | Dendmela | 0 | 0 | 0 | gone | gone |
| **43** | Feb-20 | so-86-14 | Dendmela | 2 | 2 | 1 | n | on cheese tree |
| **45** | Feb-20 | so-86-11 | Dendmela | 0 | 0 | 0 | dead | dead |
| **46a (bottom)** | Feb-20 | so-64 | Dendmela | 0 | 0 | 0 | | dead wired to Cheese Tree SW sector |
| **46b** | Feb-20 | so-64 | Dendmela | 3 | 3 | 2 | y | |
| **46c** | Feb-20 | so-64 | Dendmela | 3 | 3 | 3 | y | |
| **46d** | Feb-20 | so-64 | Dendmela | 3 | 4 | 2 | y | at pink flagging |
| **46e** | Feb-20 | so-64 | Dendmela | 3 | 3 | 3 | y | |
| **46f** | Feb-20 | so-64 | Dendmela | 3 | 2 | 1 | y | |
| **46g (top)** | Feb-20 | so-64 | Dendmela | 2 | 2 | 1 | n | wired to Cheese Tree SW sector |
| **no yellow tag** | Feb-20 | so-58 | Dendmela | 3 | 1 | 3 | y | upper plant only |
| **47** | Feb-20 | so-86-9 | Dendmela | 0 | 0 | 0 | | not found |
| **48** | Feb-20 | so-86-10 | Dendmela | 0 | 0 | 0 | | not found |

## APPENDIX 3

### Year 3 Recommended 12 month Work Plan – Tasks and Proposed Methods

| Task | Days | Personnel | Comments |
|---|---|---|---|
| Rusty Plum enhancement planting: Collect at least 40 Rusty Plum seeds locally. | 1 | Bush regenerator X 1 | Seed will be collected from local populations on public land during Oct / Nov 2020 whenever local trees are fruiting and fruit are ripe. No more than 10% of available seed will be collected from any one locality. |
| Rusty Plum seed germination: Plant Rusty Plum seeds into pots and germinate ex-situ in shadehouse until established as viable seedlings. | 1 | Bush regenerator X 1 | Collected fruits need outer layers removed before soaking the fresh seeds in water for several days prior to potting up. Germination usually occurs between 9 and 26 weeks after potting (Floyd 1989). Germinated seedlings to be tended in pots in shadehouse until weather conditions are suitable for planting out. Depending upon the length of time for germination to occur, seedlings may have to be held in pots until wet conditions prevail in late 2021 or early 2022. |
| Rusty Plum enhancement plantings: Plant Rusty Plum seedlings out into TA1 when weather conditions are suitable (as the wet season begins, eg Jan/Feb 2022. | 1 | Bush regenerator X 2 | Seedlings to be transplanted into existing tree guards, watered in with addition of a dilute seaweed-based fertiliser to reduce transplant shock, and mulched. Condition and height of each transplant to be recorded in accordance with current monitoring methodology. |
| | 1 | Ecologist | |
| Follow-up Maintenance | 0.5 per visit | Bush regenerator X 2 | Contingent upon local rainfall post-transplant. This action should be avoidable if planting occurs during the wettest time of year. However, if no rain is recorded for the week after transplant, then hand watering will be required on a weekly basis until adequate rainfall occurs. As TA1 is remote from vehicular access this will require transport of water and equipment on foot over approx. 500 metres to the Rusty Plum planting site (a small creek on the site is intermittent during dry weather but may contain sufficient water to assist with this action). |
| Follow-up Monitoring | 0.5 per visit | Ecologist | Monitoring of the seedlings will occur monthly for 3 months post-planting then once every 3 months for a year after that, then once in 6 months' time. For example, assuming seedlings are planted in February 2022, monitoring will be undertaken in March, April and May 2022, then August and November 2022, February and May 2023 then November 2023 (the November surveys will be included in the current monitoring program). A brief written report will be provided after each survey. |
| Reporting: Prepare and submit a brief report | 0.5 | Ecologist | A brief report describing the weeding program and the Rusty Plum seed collection, germination, planting and initial monitoring results will be prepared and submitted. |
| | | | |
| **Weed Control Program in TA1:** Implement a targeted program of Broad-leaved Paspalum (spot-spraying) and Lantana (cut and paint) control, with follow-up timed to minimise post-treatment seed production and germination. | 2 | Bush regenerator X 2 | One day with 2 personnel undertaking initial weed control. Follow-up 4 weeks later to manage seedling emergence. Photographs to be provided to Ecologist for incorporation into monitoring report. |