

**BUDADEE**  
ABORIGINAL  
CORPORATION



**Woodstock Environmental Offset Project**

# **FIELD SURVEY TECHNICAL NOTE**

**Author: Mathew Oliver**

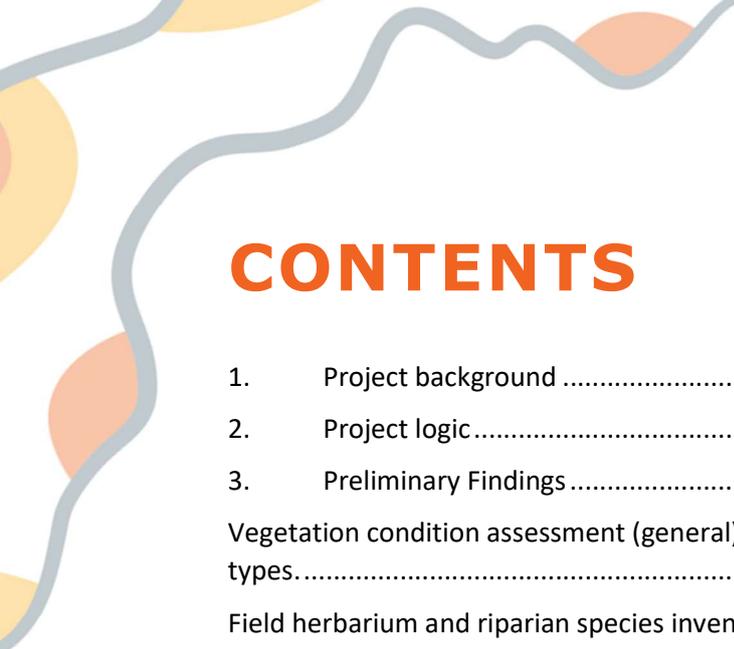
**SEPTEMBER 2021**

# Acknowledgement of Country

<https://www.reconciliation.org.au/>



Client ref  
BUD2102



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## 1. Project background

Administered by the Department of Water and Environmental Regulation (DWER), the Pilbara Environmental Offsets Fund (PEOF) was established to deliver environmental offsets in the Pilbara region of Western Australia on a strategically targeted landscape scale. The PEOF is designed to build upon regional programs that provide environmental benefits as a counterbalance to environmental impacts derived from activities and operations within the Pilbara.

Budadee Aboriginal Corporation (BAC) was awarded funding through the Pilbara Environmental Offsets Fund (competitive grant round) to undertake environmental planning, monitoring and rehabilitation within the Woodstock Abydos Protected Reserve (WAPR, refer to Map 1). The BAC employs a ranger team (the Budadee Rangers) who undertake cultural and environmental management activities primarily focussed on the WAPR. The Woodstock Environmental Offset Project (the project) was proposed as a multi-year management plan that would work alongside specialist consultants to identify impacted vegetation systems with the WAPR, alongside identifying primary threats to future vegetation condition. This information would be drafted into a management plan for the reserve (stage 1). This management plan would then act as a guiding document for active management to improve vegetation condition by the Budadee Rangers (stage 2).

Over a series of meetings with the PEOF team and other stakeholders the project was refined into a 1-year project centred on stage 1 (above) and further focussed into management of riparian system vegetation through targeted control of problematic weed species. The Weed of National Significance (WONS) *Calotropis procera* was



The Budadee Ranger team in the Yule River (Woodstock Abydos Protected Reserve)

identified as the primary threat to riparian systems and is the focus of management actions.

The Woodstock Environmental Offset Project has three primary objectives:

- Create a plan (the Tharra Rehabilitation Plan) for the improvement of riparian vegetation condition through targeted control of problematic weed species.
- Establish a monitoring system for measuring changes in vegetation condition over time.
- Improve the capacity of the Ranger team to carry out rehabilitation and monitoring activities as per DWER's Monitoring and Evaluation Framework and the Tharra Rehabilitation Plan.

*Plate 1: The Yule River immediately after heavy rains (July 2021).*

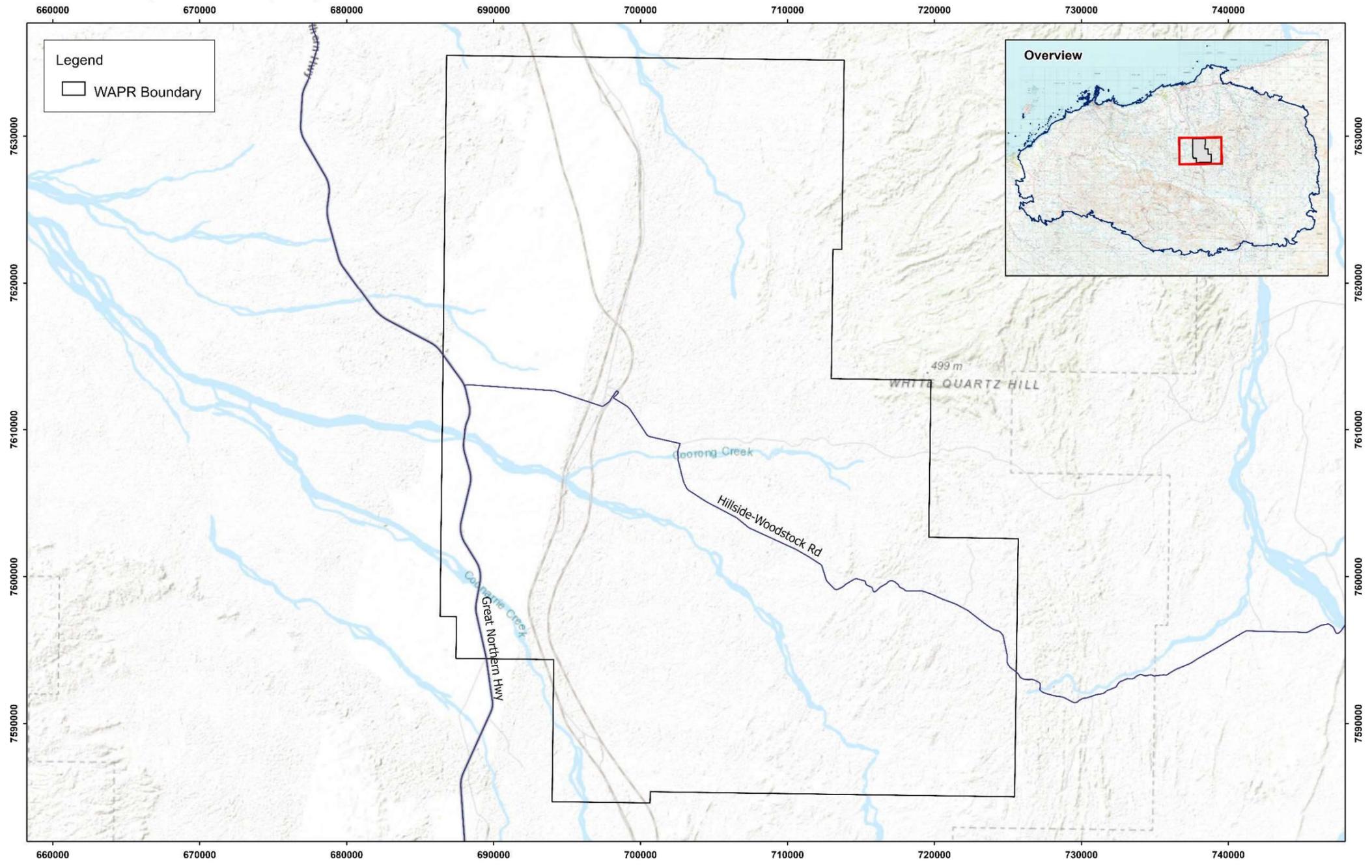
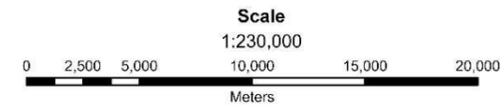


### Woodstock Abydos Protected Reserve

Job No:                      Map No: 1                      Coordinate System: GDA94 MGA Zone 50

Date: 29/09/2021                      Author: Ariell

Disclaimer: The information in this map is accurate as at the date of issue. Spatial accuracy level of +/- 15m unless otherwise noted.



## 2. Project logic

*For full project logic including milestones refer to Appendix 2 – Project Plan.*

Budadee operates on a Caring-for-Country model. Leadership from traditional owners is integrated into the delivery of work programs to ensure traditional knowledge and values influence decision making and cultural protocols are observed while on country.

Four on-country field trips and a methodology approach workshop were carried out between June and October 2021.

The first on-country trip was a seven-day reconnaissance survey (Trip 1) that refined the data from desktop research. The reconnaissance survey had the following aims:

- Identify patterns of weed distribution within the reserve (particularly WONS listed species).
- Ground-truth broad scale vegetation types.
- Determine focal areas for management effort (based on combination of feasibility, traditional value, ecological value).
- Build a riparian vegetation species inventory while training Rangers in species identification.
- Identify risks to project output (site access etc).

Experienced environmental consultant Andrew Mitchel (Pilbara Botany specialist) accompanied the ranger team during the reconnaissance survey to provide specialist advice towards the above aims.

In addition, Jo Williams from the Pilbara Mesquite Management Council provided on-country training in identifying and controlling *Calotropis procera*. Instances of *Calotropis* were controlled opportunistically as they were found.

*Plate 2: Pilbara Botanist Andrew Mitchel and Ranger Steven Stewart identify plants for the herbarium.*



*Plate 3: Botanist Andrew Mitchel recording the poorly known (P3) taxa *Gymnanthera cunninghamii* within Coorong Creek.*



*Plate 4: Weed control specialist Jo Williams provides training in *Calotropis* control at Tambina Pool.*



The results of the reconnaissance survey informed a monitoring approach workshop held in Joondalup in June 2021. This workshop further refined the objectives and methodology for the subsequent on-country field trips, ensuring methods were consistent with DWER's planned monitoring and evaluation framework (in development).

The agreed objectives for the three field trips were defined as follows:

- Map the distribution and type of Weeds of National Significance (WONS) around river systems in the Woodstock Abydos Protected Reserve.
- Define density of WONS along river systems (categorise according to low, medium, and high density).
- Control WONS in areas of low weed density.
- Define areas of medium and high-density WONS for future control.

- Install photo-points to communicate the impact of weed removal and for surveillance of weed presence (presence, absence + visual quantification) to guide future management.

The agreed methods were defined as follows:

- Track logs recorded with handheld GPS.
- Weed distributions and type recorded as point data.
- Low, medium, high density of WONS listed weeds recorded as point data (and used to map WONS density to guide future management).
- Areas of low-density weeds managed in the field.
- 40 Photo-panorama points established in the project area along riparian areas (10 in riparian, and 10 each in low, medium, and high-density areas as appropriate).

On-country field trips were held from the 31<sup>st</sup> July – 6<sup>th</sup> August (Trip 2), 23<sup>rd</sup>– 27<sup>th</sup> August (Trip 3) and 20<sup>th</sup> – 24<sup>th</sup> September (Trip 4). Photo-panorama points were established according to the AusPlots Rangelands Survey Protocols Manual with three panoramas recorded in an equilateral triangle around a central dropper (see White *et al.* 2012). Sites were spread across each of the major riparian systems at regular intervals (dependent on access), with ground truthing used to find representative areas of riparian vegetation. Site selection was also influenced by the presence of culturally significant sites on the reserve, both to avoid disturbance to sites and to guide future management towards the protection of those sites.

Weed mapping was conducted continually during the project, to map the distribution of all known weed species within the WAPR. Individual instances of weeds were recorded using point data capture (ArcGIS via Quick Capture application). In addition, GPS points were taken wherever weed control activities were carried out. GPS track logs were recorded for all movements within the reserve.

Photos, GPS data and track logs were backed up daily onto a portable hard drive and delivered to the PEOF team (DWER).

Plate 5:  
Rangers  
establish the  
first photo-  
panorama  
point in the  
Yule River.



| Project participants  |                    |                    |                     |
|-----------------------|--------------------|--------------------|---------------------|
| Trip 1 (Recon 7 days) | Trip 2 (7 days)    | Trip 3 (5 days)    | Trip 4 (5 days)     |
| April                 | July               | August             | September           |
| Steven Stewart Jnr    | Steven Stewart Jnr | Steven Stewart Jnr | Steven Stewart Jnr  |
| Andrew Mitchel        | Margaret Stewart   | Margaret Stewart   | Margaret Stewart    |
| Mathew Oliver         | Damien Ball        | Brendan Chaquebor  | Brendan Chaquebor   |
|                       | Peter Jaffrey      | Amanda Stream      | Stephen Stewart Snr |
|                       | Mathew Oliver      | Mathew Oliver      | Damien Ball         |
|                       |                    |                    | Peter Jaffrey       |
|                       |                    |                    | Mathew Oliver       |

### 3. Preliminary Findings

#### Vegetation condition assessment (general) and ground truthing of broad scale vegetation types.

Riparian vegetation condition was assessed visually by environmental consultants along the Yule, Turner and Shaw River systems within the Woodstock Abydos Protected Reserve. Generally, vegetation condition was estimated at ranging from very good to excellent over much of the surveyed range. Primary impacts on vegetation condition were deemed to be invasive weeds and grazing and trampling from cattle, both of which appeared to be exacerbated by the presence of infrastructure development within the reserve.

Plate 6: Mild cattle impacts (erosion, eutrophication) at Purrugunyah Pool.



At three sites on the Turner River, and one site on the Yule River, vegetation condition was estimated to be poor. In these locations the weed *Calotropis procera* was found in medium to high densities and had begun to crowd out native vegetation. The introduced date palm *Phoenix dactylifera* was also present in high densities on the Turner River at Pulkunah Spring. While considered an invasive species, date palms were not considered a management priority to the ranger team.

Broad scale vegetation types were ground truth-ed to ensure they accurately reflected the land system mapping from the desktop research. The existing mapping was deemed to be highly accurate except for a single unmapped granitic system east of the FMG Rail Line corridor.

Plate 7: Date palms *Phoenix dactylifera* present in high densities at Pulkunah Spring.



River systems within the Woodstock Abydos Protected Reserve are ephemeral, flowing irregularly after periods of heavy rain (December - March, May - June). Three main river systems have catchments within the reserve (the Yule River, Shaw River and Turner River). Each of these catchments have dendritic drainage patterns, with many smaller tributaries coalescing into north-flowing river systems with well developed drainage. At numerous sites within the reserve local springs provide small but continuous water discharge, creating pools of permanent water. Many of these sites have significant cultural value to Palyku and Karriyara people.

*Plate 8: An example of a river system with a permanent pool in excellent condition (Tharra Pool).*



“Granite dominates the landscape of Woodstock/Abydos. The granitic land systems; Boolaloo, Granitic, Macroy and River make up about 90% of the country. The large granite domes that are bare of spinifex may provide fire refuges as do breakaways.” Andrew Mitchell, on-country communication (2021).

## Field herbarium and riparian species inventory

Approximately one hundred and fifty native plant species were identified within the WAPR. For each species, voucher specimens were taken and added to the Budadee field herbarium. This herbarium will act a future resource for plant identification by the ranger team. The field herbarium is also being used to capture traditional names (Palyku and Kariyarra language) for plants within Palyku and Kariyarra country. It was estimated that the field herbarium includes approximately two-thirds of the total plant diversity within the reserve (Andrew Mitchel, 2021).

Plate 9: Representative specimens were collected for each identified plant species within the WAPR and stored in the Budadee Herbarium.



One priority species *Gymnanthera cunninghamii* was seen within river systems on the Turner River and Coorong Creek (Yule River). This plant is listed as Priority 3 (P3) on the Declared Rare and Priority Flora List. Other priority species recorded close to river systems include *Nicotiana umbratica* (P3) found on rocky outcrops bordering riparian areas, *Acacia levata* (P3) found in sandy soils over granite and *Heliotropium murinum* (P3) found along red soil plains near gallery hill.

Plate 10: *Gymnanthera cunninghamii* (P3) as observed within the Yule River on the Woodstock Abydos Protected Reserve.



## Weed mapping

Weed mapping was conducted as light vehicle reconnaissance when moving between sites, and on foot during field surveying and while establishing photo-panoramas. Observed instances of identified weed species were recorded as point data. A total of twelve weed species were identified over the four on-country trips on the Woodstock Abydos Protected Reserve (refer to Table 1).

Table 1: Weed species and observation frequency.

| Species                          | Observations* |
|----------------------------------|---------------|
| <i>Aerva javanica</i>            | 613           |
| <i>Argemone ochroleuca</i>       | 26            |
| <i>Bidens subalternans</i>       | 20            |
| <i>Calotropis procera</i> (WONS) | 798           |
| <i>Cenchrus ciliaris</i>         | 1557          |
| <i>Cenchrus setiger</i>          | 70            |
| <i>Chloris virgata</i>           | 125           |
| <i>Citrullus colocynthis</i>     | 24            |
| <i>Flaveria trinervia</i>        | 43            |
| <i>Malvastrum americanum</i>     | 8             |
| <i>Vachelia farnesiana</i> **    | 186           |
| <i>Phoenix dactylifera</i> ***   | Not recorded  |

\*Observation numbers are recorded point data instances and not representative of the total number of individual plants within the WAPR.

\*\* Only 12 of these plants were recorded within the WAPR boundary, the remainder are north of the reserve.

\*\*\*While considered an introduced species, the date palm *Phoenix dactylifera* was not considered a management priority for Budadee and was not recorded.

The introduced grass *Cenchrus ciliaris* (buffel grass) was by far the most widespread and numerous weed species on the reserve and found to be present along the banks of all surveyed river systems. This species occurs as a resilient tufted grass (0.3 – 1.5 metres tall) with distinct ciliated purple seed heads February to October. This species is widely distributed throughout the Pilbara and known to negatively impact native vegetation through direct competition and by increasing fuel load for fires (Marshal *et al.* 2012).

*Plate 11:*  
*Cenchrus*  
*ciliaris*  
*(buffel*  
*grass)*  
*within the*  
*Turner*  
*River.*



*Aerva javanica* (kapok) was found to be the second most observed weed species on the WAPR, largely concentrated parallel to infrastructure corridors such as roads and rail. This is consistent with its general distribution throughout the Pilbara, where it is known to follow areas of high disturbance along rail and road corridors. It is also known to aggressively recolonise after native vegetation has been cleared, for example after fire or land clearing (Webber *et al.* 2017). While little is known on its ecological impact on native vegetation, it remains a species of concern for Budadee.

*Plate 12:* *Aerva javanica*  
*(kapok). This species is*  
*common along road and*  
*rail corridors within the*  
*reserve.*



*Calotropis procera* (rubber tree) is a fleshy leaved shrub or tree with distinct white and purple flowers and large seed pods. This species is increasing in distribution throughout the Pilbara and can rapidly form dense thickets that shade and out-compete native plants. Seeds rapidly disperse by wind and water, as well as through zoochory (animal dispersal). Management of this species should focus on controlling populations in upstream river systems such as catchments (Webber *et al.* 2012).

This species is recognised as a Weed of National Significance (WONS), a Western Australian Declared Pest (C1 prohibited) and is a primary management concern for Budadee.

*Calotropis procera* was identified in the upper catchments of both the Yule and Turner Rivers within the WAPR. Densities were highest within the Turner River, particularly south of Purrugunyah Pool (near Abydos station). In the Yule and Coorong rivers, *Calotropis* was found to be widespread albeit in very low densities. Isolated or small clusters of young plants were found in Coorong Creek and interspersed along the length of the Yule River. These were controlled as they were identified. One larger area of medium density was recorded on the Yule River near the westernmost border of the WAPR (refer to Appendix 1, Maps 2 - 4).

*Plate 13: Ranger Peter Jaffrey showing off a young Calotropis procera near Honeymoon Pool (Yule River).*



## Weed Control

*Calotropis procera* was targeted for weed control alongside all on-country activities. An estimated total of 1800 hectares of the Turner River and 7000 hectares of the Yule River were traversed during the project, with all identified *Calotropis procera* plants either controlled or marked for control as they were identified.

Wherever it was feasible to do so (low and medium density areas), *Calotropis* was removed using the 'cut and paint' method, whereby trees are severed at the base and immediately doused in herbicide (active ingredient 4.47 g/L aminopyralid, 44.7 g/L picloram). This method was shown to be the most reliable way to ensure management of *Calotropis procera* (Jo Williams, Pilbara Mesquite Management Council, on-country training). An estimated total of 734 mature plants were controlled over the course of the project (see Appendix 1, Map 5).

Areas that could not be feasibly controlled during mapping and survey works (due to high density and large size of plants) were mapped and density recorded to allow for follow up management. Weed control sites were mapped using handheld GPS units and using Samsung tablets through ArcGIS Collector (Quick Capture application).



Plate 14: Rangers  
Steven and Anton cut  
and poison *Calotropis  
procera* at Tambina  
Pool

## Photo-panoramas

A total of forty photo-panorama sites were installed within the WAPR. River systems were identified during the reconnaissance survey as well as previous ranger work programs as being the primary habitat and dispersal vector for the WONS listed weed *Calotropis procera*. Photo-panorama sites were selected to maximise coverage within the main river systems within the reserve (i.e., the Yule and Turner Rivers), and ground-truthed to ensure sites were representative of riparian habitat at each selected site. One photo-panorama site was also established in the upper catchment of the Shaw River (western edge of the WAPR), due to its proximity to the heritage site Tambourah Pool and identified instances of *Calotropis procera* just outside of the reserve. Due to the high density of both registered and un-registered heritage sites within the WAPR, consultation with elders and senior rangers during field work ensured works avoided disturbance at significant sites and cultural protocols were adhered too (gendered sites, site avoidance etc). Consultation with elders also helped to establish photo-panoramas on the boundaries of heritage sites within the path of weed dispersal vectors.

Methodology was consistent with the AusPlots Rangelands Survey Protocols Manual (Chapter 4. Photo-panoramas), with three photo-panoramas taken at each site around a central dropper. Photos were taken in raw format and provided to DWER for analysis.

*Plate 15:  
Rangers  
Brendan  
Chaquebor,  
Peter Jaffrey  
and Margaret  
Stream  
measure out a  
photo-  
panorama site  
in the Turner  
River.*



Estimates of *Calotropis procera* density was made at each photo-panorama site to identify the site as either:

- Low Density - scattered (less than 5) instances of *Calotropis procera* within 1 km radius of point. Note that these instances were controlled as they were identified.

- Medium Density - greater than five instances of *Calotropis procera* but less than 100 within 1 km radius of point. Typically clustered instances including flowering or seeding plants. These sites were controlled as they were identified.
- High Density - greater than 100 instances of *Calotropis procera* within 1 km radius of point. Usually includes mature trees. High density and large size of trees made them unfeasible to control during this project. Dedicated control trips are required to manage these sites.
- None – no instances of *Calotropis procera* within 1km of site.

A total of ten photo-panoramas were established in areas of low density, three in areas of medium densities, five in areas of high density and twenty-two in areas with no instances of *Calotropis procera* (refer to Table 2 and Appendix 1, Map 6).

Plate 16:  
Rangers  
Margaret  
Stewart and  
Damien Ball  
photograph  
vegetation  
condition on  
the bank of  
the Turner  
River.



Table 2: Photo-panoramas within the WAPR

| Photo-panorama Number | River System | Weed density* |
|-----------------------|--------------|---------------|
| WAPB_PIL01_0001       | Yule River   | Low density   |
| WAPB_PIL01_0002       | Yule River   | None          |
| WAPB_PIL01_0003       | Yule River   | None          |
| WAPB_PIL01_0004       | Yule River   | None          |

|                        |                      |                |
|------------------------|----------------------|----------------|
| <b>WAPB_PIL01_0005</b> | Yule River           | None           |
| <b>WAPB_PIL01_0006</b> | Coorong Creek (Yule) | None           |
| <b>WAPB_PIL01_0007</b> | Coorong Creek (Yule) | Low density    |
| <b>WAPB_PIL01_0008</b> | Coorong Creek (Yule) | None           |
| <b>WAPB_PIL01_0009</b> | Coorong Creek (Yule) | Low density    |
| <b>WAPB_PIL01_0010</b> | Coorong Creek (Yule) | Low density    |
| <b>WAPB_PIL01_0011</b> | Yule River           | None           |
| <b>WAPB_PIL01_0012</b> | Yule River           | None           |
| <b>WAPB_PIL01_0013</b> | Yule River           | None           |
| <b>WAPB_PIL01_0014</b> | Yule River           | None           |
| <b>WAPB_PIL01_0015</b> | Yule River           | None           |
| <b>WAPB_PIL01_0016</b> | Yule River           | Medium density |
| <b>WAPB_PIL01_0017</b> | Yule River           | None           |
| <b>WAPB_PIL01_0018</b> | Yule River           | Low density    |
| <b>WAPB_PIL01_0019</b> | Yule River           | Low density    |
| <b>WAPB_PIL01_0020</b> | Yule River           | None           |
| <b>WAPB_PIL01_0021</b> | Yule River           | None           |
| <b>WAPB_PIL01_0022</b> | Yule River           | None           |
| <b>WAPB_PIL01_0023</b> | Turner River         | Medium density |
| <b>WAPB_PIL01_0024</b> | Turner River         | High density   |
| <b>WAPB_PIL01_0025</b> | Turner River         | Medium density |
| <b>WAPB_PIL01_0026</b> | Turner River         | None           |
| <b>WAPB_PIL01_0027</b> | Turner River         | High density   |
| <b>WAPB_PIL01_0028</b> | Turner River         | Low density    |
| <b>WAPB_PIL01_0029</b> | Turner River         | None           |
| <b>WAPB_PIL01_0030</b> | Turner River         | None           |
| <b>WAPB_PIL01_0031</b> | Turner River         | Low density    |
| <b>WAPB_PIL01_0032</b> | Turner River         | High density   |
| <b>WAPB_PIL01_0033</b> | Turner River         | Low density    |
| <b>WAPB_PIL01_0034</b> | Turner River         | None           |
| <b>WAPB_PIL01_0035</b> | Yule River           | None           |
| <b>WAPB_PIL01_0036</b> | Yule River           | None           |
| <b>WAPB_PIL01_0037</b> | Turner River         | Low density    |
| <b>WAPB_PIL01_0038</b> | Turner River         | High density   |
| <b>WAPB_PIL01_0039</b> | Turner River         | High density   |
| <b>WAPB_PIL01_0040</b> | Turner River         | None           |

\*WONS listed *Calotropis procera* densities.

## 4. Management recommendations

### Primary weeds within the WAPR

The introduction and spread of weeds remain one of the biggest threats to the cultural and environmental values of the Woodstock Abydos Protected Reserve. Within river systems invasive grasses *Cenchrus ciliaris* and *cenchrus setiger* are long established as the primary understorey along almost all drainage lines within the reserve. In natural areas adjacent to infrastructure pathways such as roads and rail, the perennial herb *Aerva javanica* is well established, with smaller scattered populations appearing on the margins of drainage lines. The upright, thorny shrub *Vachellia farnesiana* was common along the rail corridors immediately outside the reserve, with a small population found near rail infrastructure adjacent to the Yule River within the reserve.

However, by far the most alarming changes in weed distribution and density have occurred in the WONS listed flowering tree *Calotropis procera*. This species is known to competitively displace native vegetation, and its seeds are rapidly dispersed by wind, water and through the movement of animals, particularly cattle.

Accounts from elders and senior rangers identify *Calotropis procera* in river systems at the nearby town of Marble Bar in 2015 (approximately 150 kilometres east of the WAPR). By 2018 the species was recorded at two sites on the Turner River and by 2021 more than 800 records of mature plants were identified throughout the reserve including the upper catchments of all three river systems (the Turner, Yule and Shaw Rivers). Prior to these recordings the species was undocumented within the reserve. Budadee believes that *Calotropis procera* is a recent (less than 10 years) introduction at the WAPR. It is highly recommended that this species be targeted for weed control.

*Plate 17: If left unchecked Calotropis procera spreads rapidly, such as pictured here on the Yule River within the WAPR.*



## *Calotropis procera* control recommendations

Distribution of *Calotropis procera* was found to be limited to drainage lines and riverbanks within the surveyed area. For much of the survey area plants were identified in low densities and controlled opportunistically as they were spotted. These trees appeared as juvenile plants, most of which had not yet begun to flower. At these locations across the reserve, a continuation of opportunistic control undertaken during photo-panorama monitoring follow-up trips should be sufficient to ensure emerging plants are treated and removed.

At an additional eight locations along the reserve mature plants were identified, many of which were flowering and/or seeding. Opportunistic control was conducted at three of these locations, however, follow up treatment is required to ensure emerging plants from the seedbank are treated and removed. In the remaining five of these locations, plants were too large and dense to feasibly be controlled during this project. Until controlled, these areas will likely continue to disperse seeds. All five of these high-density areas are located in the upper catchment of the Turner River.

*Plate 18: Flowering plants targeted for control at a medium density site on the Yule River.*



Due to the relatively low numbers and young age of *Calotropis procera* plants over much of the WAPR, and the relatively confined distribution of mature plants to the upper Turner River and the western boundary of the Yule River (refer to Appendix 1, Maps 2-4), a concentrated effort to control this plant could be feasibly undertaken. High density areas on the Turner River should be controlled as a priority, to limit seed dispersal. A continuation of the 'cut and paint' techniques used to control other sites can be implemented here, albeit with a larger team over a series of on-country trips. This should be followed up on the western boundary of the Yule River. Once these five high density locations are under control, follow-up weed control could be undertaken through annual on-ground surveys by a smaller team of rangers during photo-monitoring surveys. A multi-year approach is required to control new plants as they emerge from the seedbank.

## 5. References

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*Plate 19: Rangers and PEOF team pose for a photo at Woodstock. From left to right: Grey Mackay, Peter Jaffrey, Clare Merredith, Margaret Stewart, Mat Oliver, Steven Stewart Jnr, Damien Ball.*



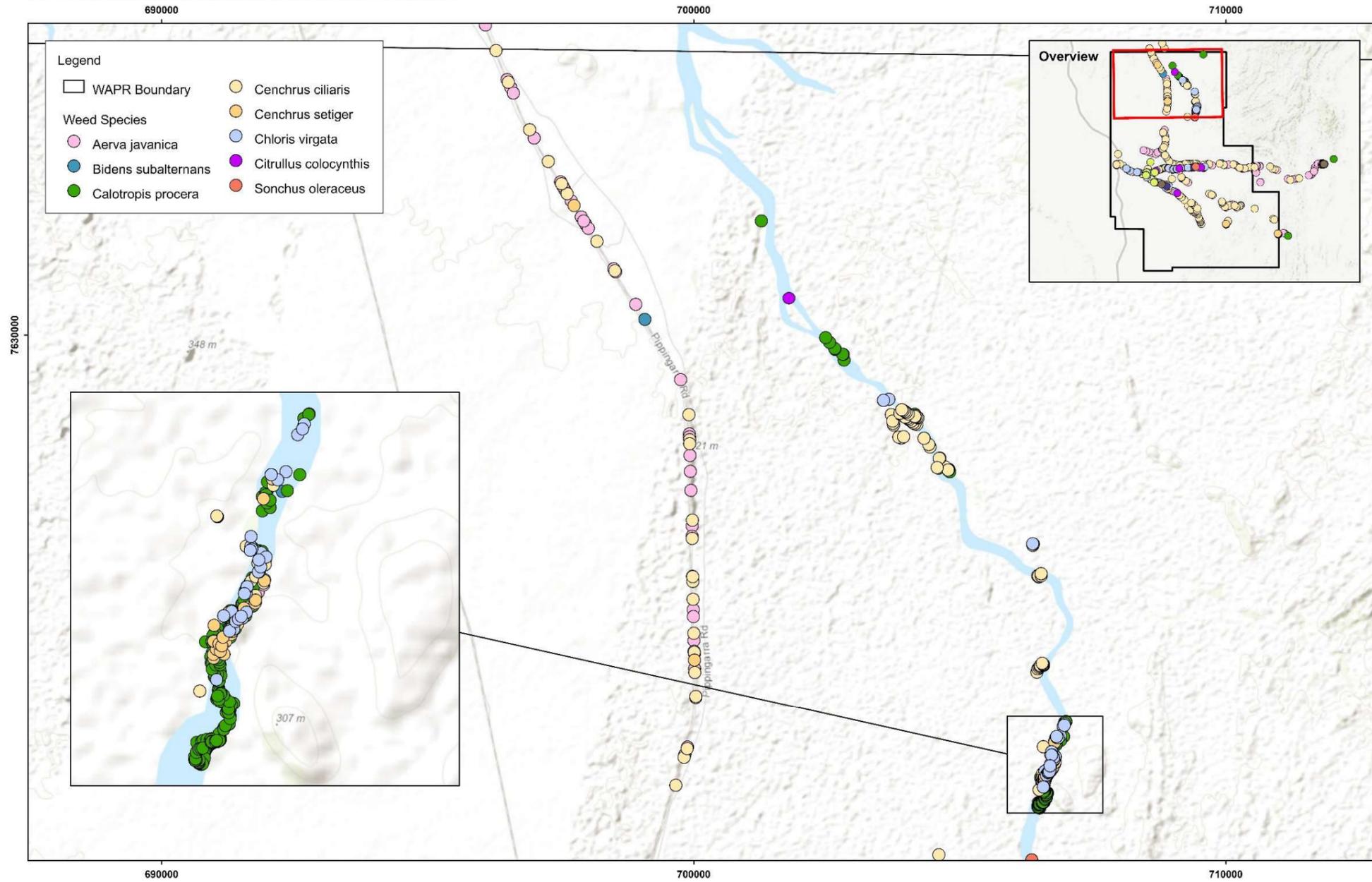
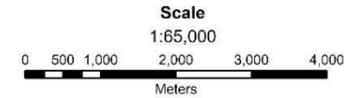
# Appendix 1: Maps

Map 2: Weed Distribution in the Turner River

## Weed Species Distribution in Turner River

Job No:                      Map No: 1                      Coordinate System: GDA94 MGA Zone 50  
Date: 29/09/2021                      Author: Ariel L

Disclaimer: The information in this map is accurate as at the date of issue. Spatial accuracy level of +/- 15m unless otherwise noted.



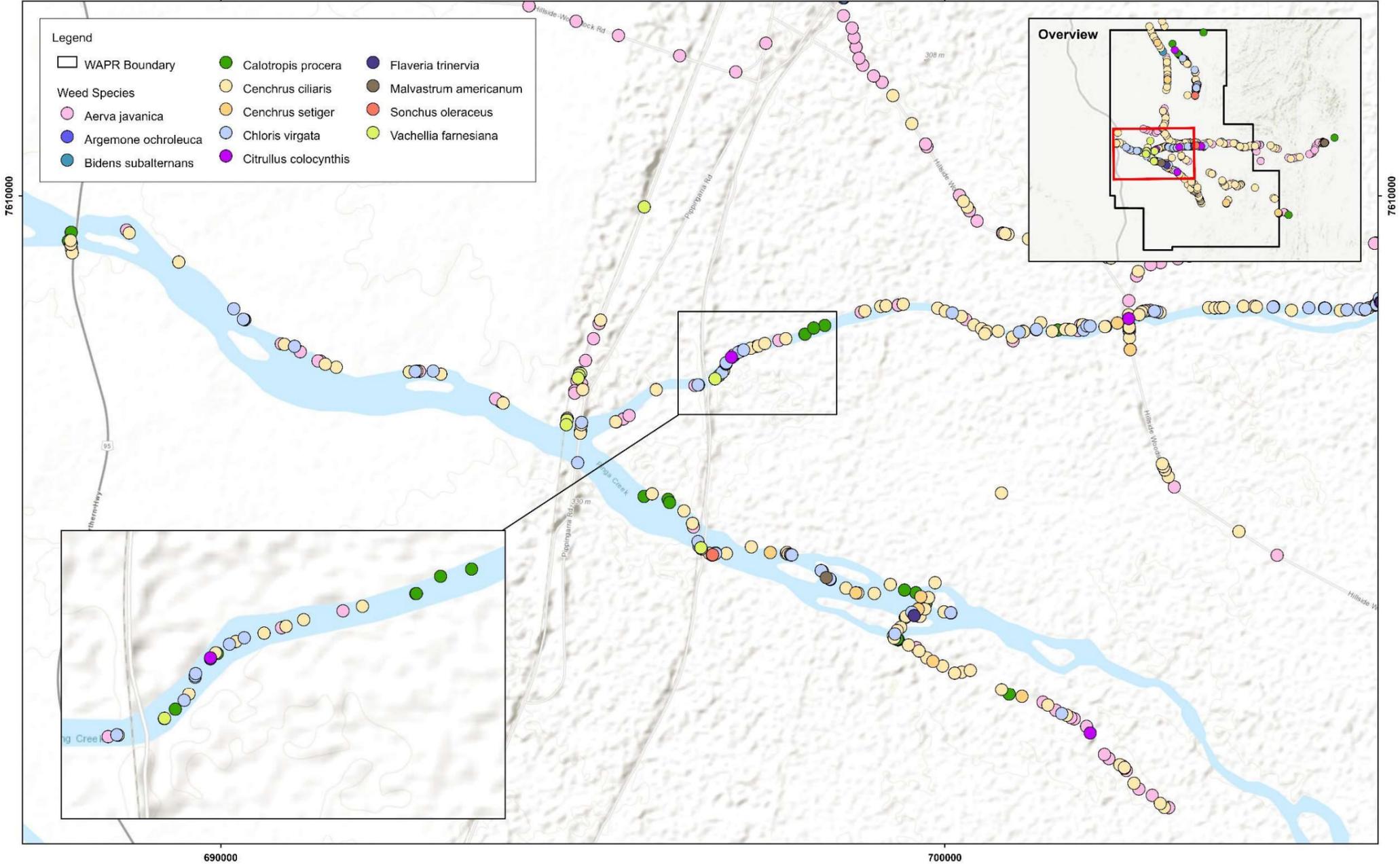
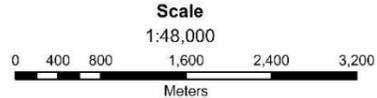
Map 3: Weed Distribution in the Yule River (West)

**Weed Species Distribution in Yule River West**

Job No:                      Map No: 1      Coordinate System: GDA94 MGA Zone 50

Date: 29/09/2021                      Author: Ariell

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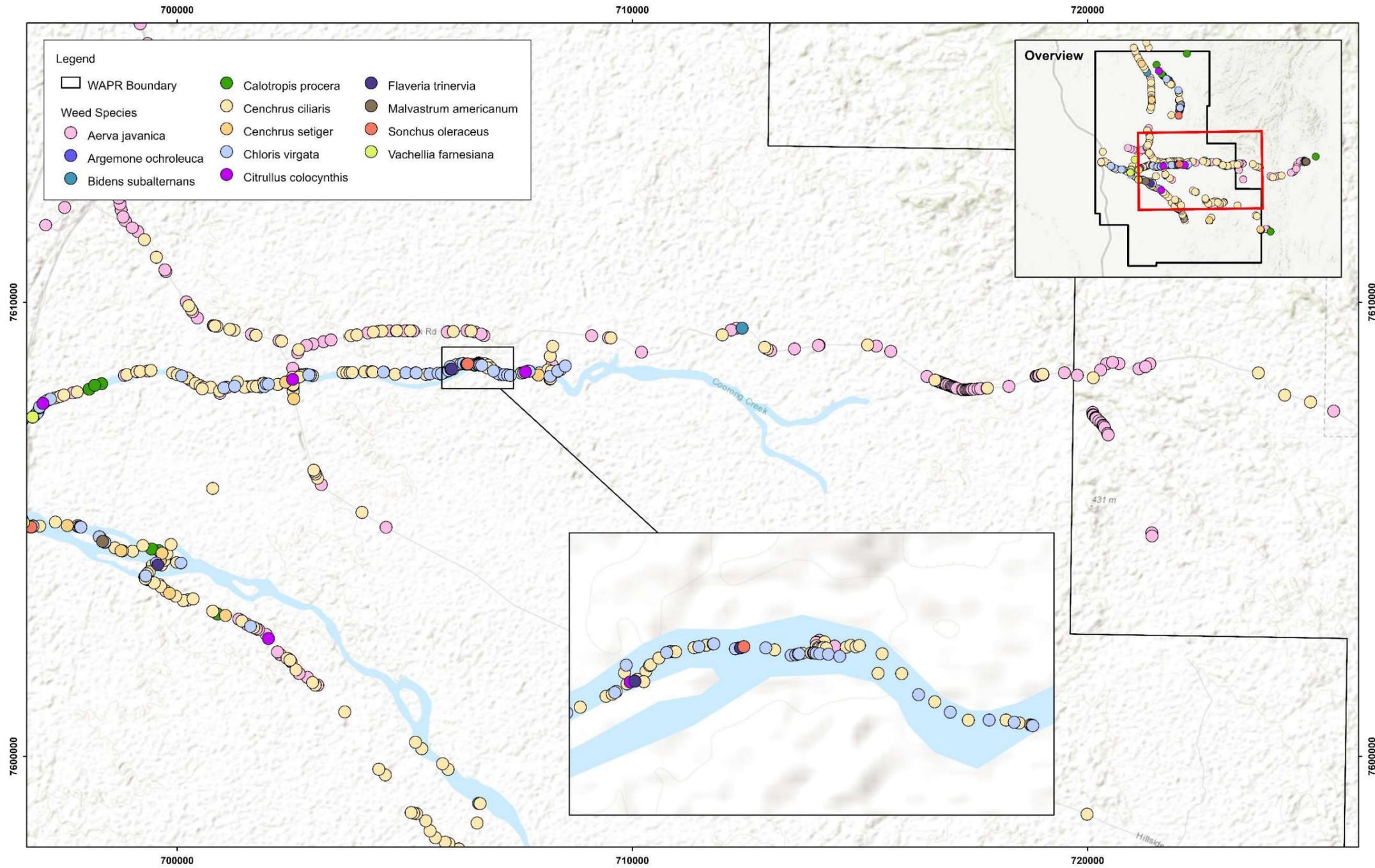
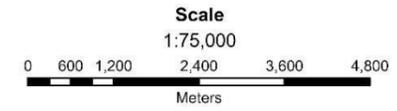
Map 4: Weed Distribution in Yule River (East)

### Weed Species Distribution in Yule River East

Job №:                      Map №: 1      Coordinate System: GDA94 MGA Zone 50

Date: 29/09/2021                      Author: Ariell

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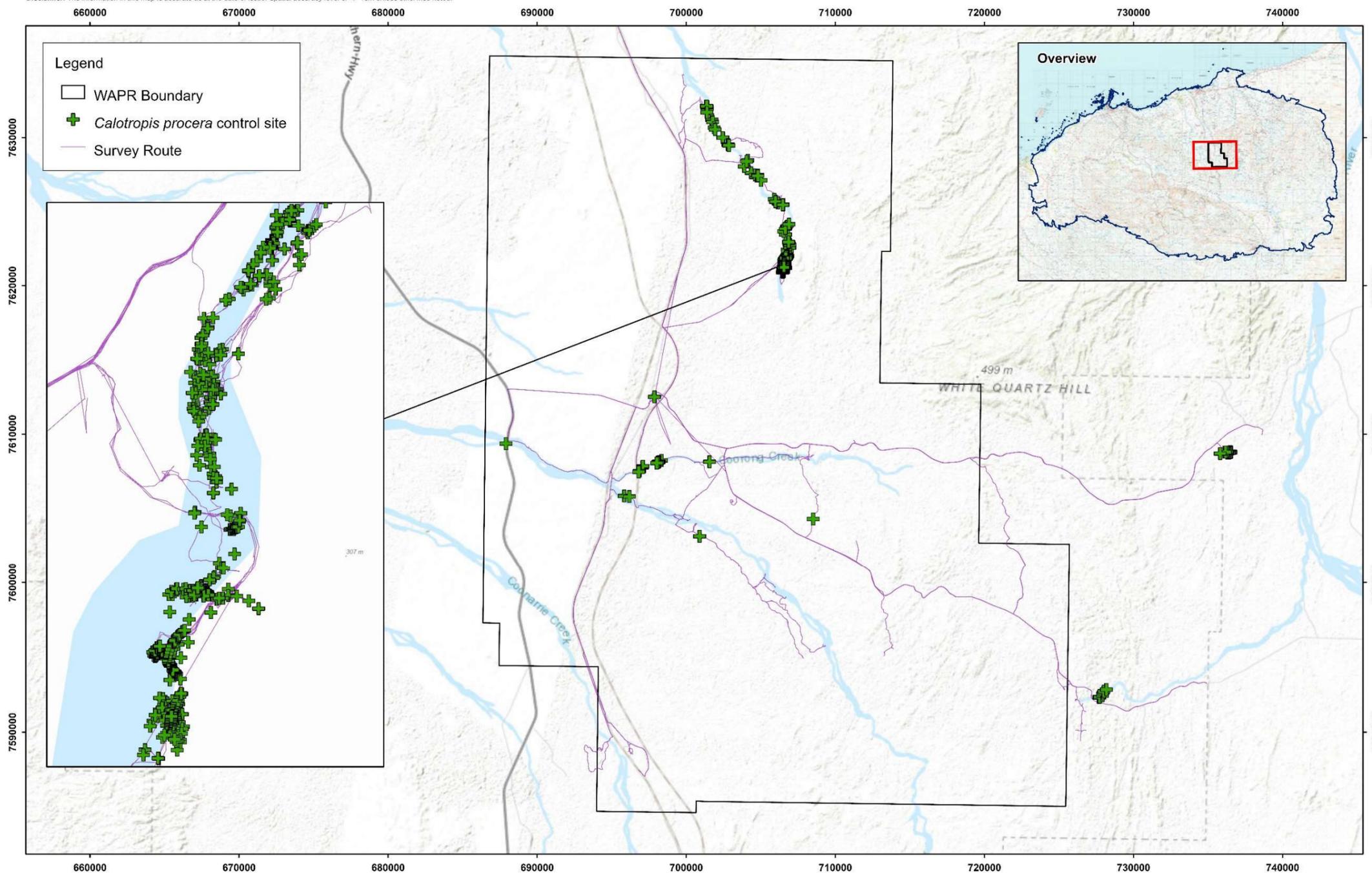
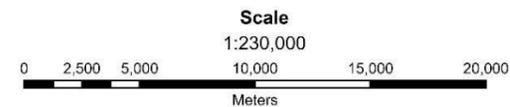
Map 5: Weed Control Locations

### Weed control locations within Woodstock Abydos Protected Reserve

Job No:                      Map No: 1                      Coordinate System: GDA94 MGA Zone 50

Date: 29/09/2021                      Author: Ariell

Disclaimer: The information in this map is accurate as at the date of issue. Spatial accuracy level of +/- 15m unless otherwise noted.



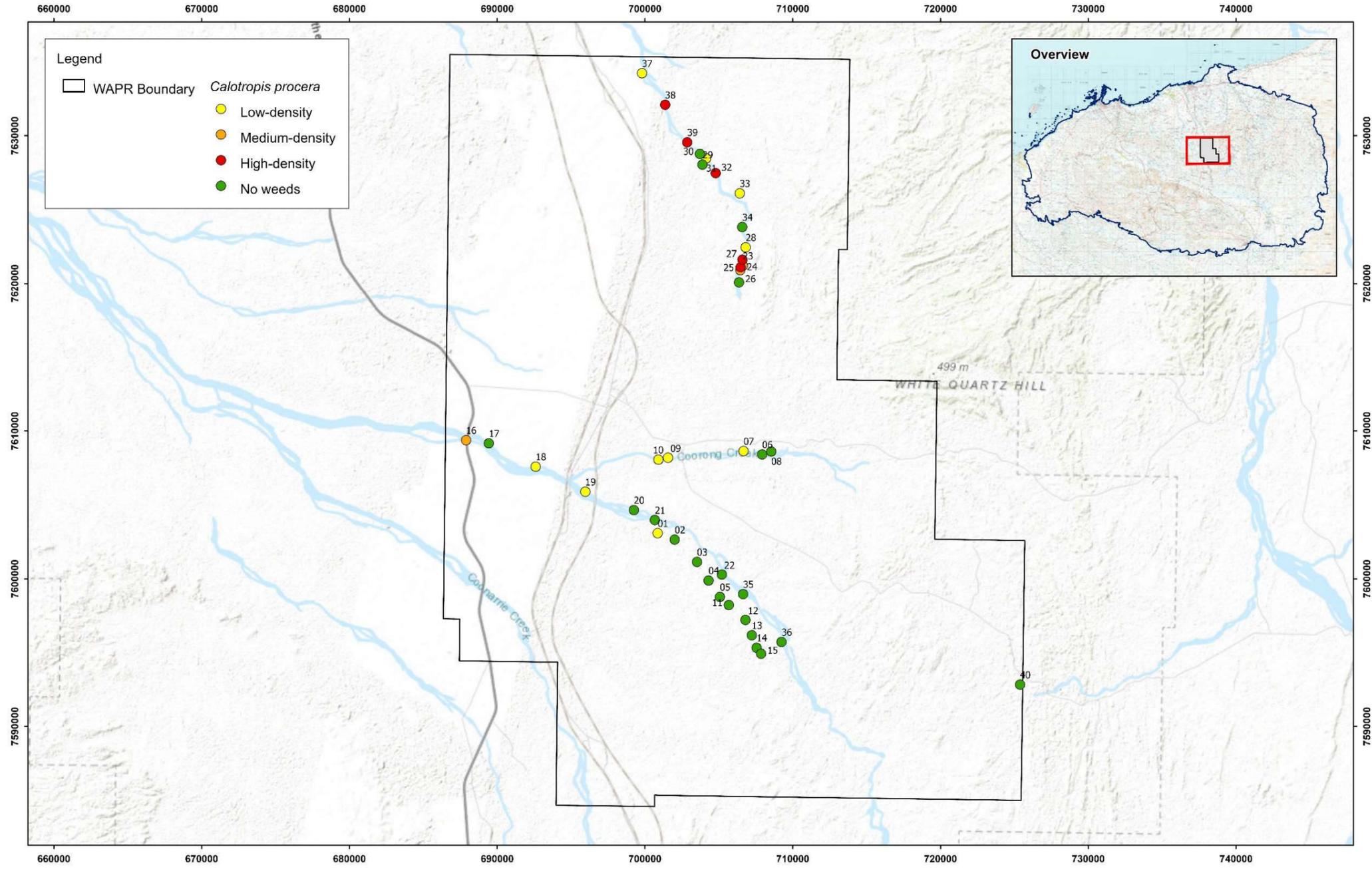
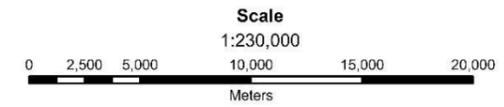
Map 6: Photo-panorama locations

### Photo-panorama locations

Job No:                      Map No: 1                      Coordinate System: GDA94 MGA Zone 50

Date: 29/09/2021                      Author: ArielL

Disclaimer: The information in this map is accurate as at the date of issue. Spatial accuracy level of +/- 15m unless otherwise noted.



## Appendix 2: Project contacts

Redacted for publication.

## Appendix 3: Project Plan

This project plan is for the first year's (2021) activities on the Woodstock Environmental Offset Program (WEOP), with a focus on collecting information to support weed management, the exchange of botanical knowledge between Traditional Owners and scientists, and design of a vegetation monitoring approach for the project. It has been designed to allow for close coordination between Department of Water and Environment Regulation (DWER) and the Budadee Aboriginal Corporation (BAC).

The proposal centres around the following key milestones:

| <u>Timeframe</u> | <u>Milestone</u>  |
|------------------|---|
| April 2021       | 1. Desktop research and reconnaissance survey   |
| May 2021         | 2. Monitoring and evaluation workshop<br>Vegetation condition assessment methodology approved and drafted. Digital recording forms built (if required). |
| July 2021        | 3. Interim status report after 1st vegetation condition assessment survey   |
| October 2021     | 4. Field work completed and Field Survey Technical Note provided to DWER.   |
| January 2021     | 5. Tharra Riparian Management Plan (with a focus on weed management) (final) submitted to DWER for final approval.                                      |

Successful evaluation and monitoring of vegetation condition for PEOF projects will require a consistent approach that can be replicated across projects.

DWER asked that vegetation condition monitoring be omitted from the proposed Woodstock Environmental Offset Program (WEOP), however an assessment of baseline vegetation condition is fundamental to development of the entire project including to identify degraded areas, define desired outcomes and strategies to deliver those outcomes to cost effectively improve vegetation.

Budadee proposes to collaborate closely with DWER in the design and implementation of a baseline vegetation assessment for use in both guiding the delivery of the vegetation condition improvement targets of the WEOP, as well as being standardised for broader use across Pilbara Environmental Offset Projects.

### **1. Background desktop research to guide approach. February/March 2021**

One and a half days work for one environmental consultant is provided to undertake background research for the Woodstock Abydos Protected Reserve (WAPR). This research will form the basis for determining key vegetation structures, areas of cultural and conservation significance, known and potential threats and to guide future field surveys. There will be a focus on riparian areas. Key research outcomes will be to identify the following at the WAPR:

- Range of vegetation types (this will be based on Beard (1975), Van Vreeswyk *et al* Department of Agriculture Technical Bulletin No 92, various State and Commonwealth data base sites, other consultants' reports etc).
- Areas of high conservation value (eg TECs or PECs)
- Areas of high cultural value to the Budadee people
- Range of species
- List of predominant known weeds
- Summary of other threats
- Optimal seasonal timings for vegetation assessment

## **2. Reconnaissance Survey. April 2021.**

One seven-day on-country reconnaissance survey will be undertaken with four Budadee Rangers, one elder and two environmental consultants to refine the data from the desktop research. Survey effort will concentrate on areas which have been determined as having high potential and most value for riparian management (with a focus on weeds), based on vegetation type, cultural and/or conservation significance and known threats. The data collected during the reconnaissance survey will guide planning for weed management activities and vegetation monitoring. An additional three days for one environmental consultant are included to cover trip planning, data management, interpretation, and reporting.

Field data will be collected to:

- Ground-truth broad scale vegetation types (generally these are at NVIS<sup>1</sup> Level I or II) identified in the background research as being candidates for management and further describe them at NVIS Level IV or V which is more suitable for realistic evaluation of restoration potential).
- Determine final areas for focus of management effort (based on combination of feasibility, traditional value, ecological value).
- Build a riparian vegetation species inventory while training Rangers in species identification.
- Determine at this stage factors which may be detrimental to success of management effort in any of the focus areas such as site accessibility (if the site is difficult to access then work may be hampered and not consistent)
- Determine the risks that may negatively impact success – is it feasible to manage them?
- Identify areas for opportunistic weed control of Weeds of National Significance (e.g. spot control of *Calotropis sp*).

Consultation with traditional owners is built into the delivery of the reconnaissance trip to capture traditional knowledge and values for choice of focus areas for potential management and implementation into the management approach.

|   |
|---|
| Milestone 1. Desktop assessment and reconnaissance survey |
|---|

## **3. Monitoring and Evaluation Approach Workshop. May 2021.**

DWER is developing a monitoring and evaluation framework for the Pilbara Environmental Offsets Fund which will define the method, and attributes to monitor vegetation condition at both a landscape and targeted project scale. The method and attributes will be based on the National AusPlots approach which defines standard metrics, data collection and storage procedures. DWER expects the framework to be complete by early April.

Following the reconnaissance survey, one day is allocated for four people (two Budadee Rangers and two environmental consultants) to meet with the DWER's PEOF team for a monitoring and evaluation approach workshop to be held in May of 2021.

The workshop will define the location, method, and metrics to monitor vegetation condition at Woodstock over the longer term and will be informed by the PEOF monitoring and evaluation framework.

The workshop will also allow for broader discussions on how monitoring and evaluation can be best actioned for this and other projects (if applicable). The outcomes of this workshop will inform the method for collection of vegetation baseline information as part of WEOP.

#### **4. Methodology Designed. May 2021.**

Two days of desktop work has been assigned to write a methodology for vegetation condition assessment based on data collected from the reconnaissance survey and on the outcomes of the Monitoring and Evaluation Approach Workshop. This methodology will be designed to be standardised for use across any PEOF site assessing the same vegetation complexes. Data recording forms (paper and digital) will be built, (if they do not already exist in the AusPlot manuals, or DWERs Monitoring and Evaluation Framework), to record vegetation condition.

The methodology approach will be shared with DWER for comment, with recommendations built into the methodology as required.

|   |
|---|
| Milestone 2. Vegetation condition assessment methodology approved and drafted. Digital recording forms built if needed. |
|---|

#### **5. Vegetation Condition Assessment Surveys. June to October 2021**

Three five-day on-country field surveys will be undertaken with four Budadee Rangers, one elder and two environmental consultants to record baseline vegetation condition data as per the approved methodology, as well as record information on appropriate management strategies and implementation methods. An additional three days per trip for one environmental consultant are included to cover trip planning, data management, interpretation, and reporting.

Sites selected for baseline vegetation condition assessment will be recorded in a way to allow for inclusion into ongoing monitoring as part of the Monitoring and Evaluation Framework.

Key outcomes of field-surveys include:

- Vegetation condition assessment data collected within riparian zones of the WAPR project area, in line with proposed monitoring and evaluation framework

methodologies. Vegetation types that could be targeted for improvement spatially mapped (1000 hectares).

- Soil and landform description
- Record of any land degradation (erosion, rills, scalds etc)
- Recording information provided by Elders on historical use of land and any special attributes that they see as important to include in a riparian management plan
- A description of all environmental threats associated with the area
- An assessment of accessibility of the site
- Site specific management actions for weed management assigned.
- Approval from elders on proposed management actions.
- Spot control of Weeds of National Significance within the WAPR project area (e.g. spot control of *Calotropis sp.*).

#### Milestone 3. Interim status report after 1st vegetation condition assessment survey

An additional 2 days of desktop work for one environmental consultant will be included to summarise the results of the field surveys and recommend options for vegetation condition improvement and protection (with a focus on riparian areas), as identified during the surveys.

#### Milestone 4. Field Work Completed and field survey technical note provided to DWER

### **6. PEOF Program team consultation meeting regarding results and reporting.**

Through ongoing discussions, it is understood that DWER are developing a preferred reporting template for reporting on the outcomes of PEOF projects.

One day has been allocated for up to four people (two Budadee Rangers and two environmental consultants) to meet with the DWER's PEOF team to discuss the project's progress, preferred reporting strategies and preferred format for the Tharra Riparian Management Plan.

### **7. Drafting of the Tharra Riparian Management Plan**

After an agreed upon format for reporting on the outcomes of the Stage 1 WEOP has been decided upon, ten days are allocated to draft the Tharra Riparian Management Plan (or equivalent).

This Plan will be designed set a clear schedule of works to manage weeds along riparian areas with the intent of improving the condition of at least 1000 hectares of native vegetation.

It will present the results from the background research and on-country surveys conducted in 2021, outline weed threats to vegetation condition, objectives for management, and detail traditional values and cultural protocols that need to be taken into account during implementation (as appropriate). The Draft Riparian Management Plan (v1) will be circulated to DWER for comment.

Draft Riparian Management Plan completed and circulated to DWER and Traditional Owners.

## **8. Amendments to the Tharra Riparian Management Plan based on Stakeholder comment.**

The Draft Tharra Riparian Management Plan (v1) will be presented to Traditional Owners through an agenda item during the Palyku-Jartayi Aboriginal Corporation general meeting and/or the Budadee Aboriginal Corporation general meeting. This will allow the proposed management actions to be discussed for approval but the broader community including elders, Budadee Directors and wider Palyku community. Consultation with Karriyarra Traditional Owners (who have Native Title Determination over much of the northern section of the WAPR) will be facilitated through elders and Senior Rangers Margaret Stewart and Steven Stewart, and opportunities for circulation within the Yandeyarra community will be explored where appropriate.

Two days for one environmental consultant have been allocated for amendments based on feedback from stakeholder consultation (such as Traditional Owner consultation and DWER comments) to be incorporated into the Tharra Riparian Management Plan.

Tharra Riparian Management Plan (version 2) drafted and submitted to DWER for approval.

An amended draft including any potential amendments from stakeholder consultation will be submitted to the DWER for final approval.

Milestone 5. Tharra Riparian Management Plan (Final) submitted to DWER for final approval.

The Final Tharra Riparian Management Plan will act as the guiding document for weed management for the WEOP.

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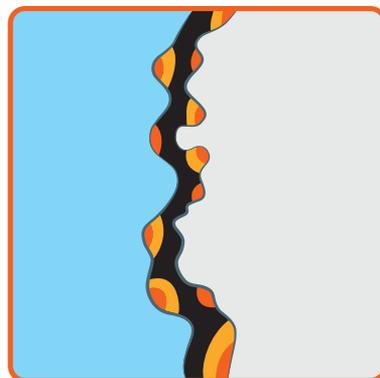
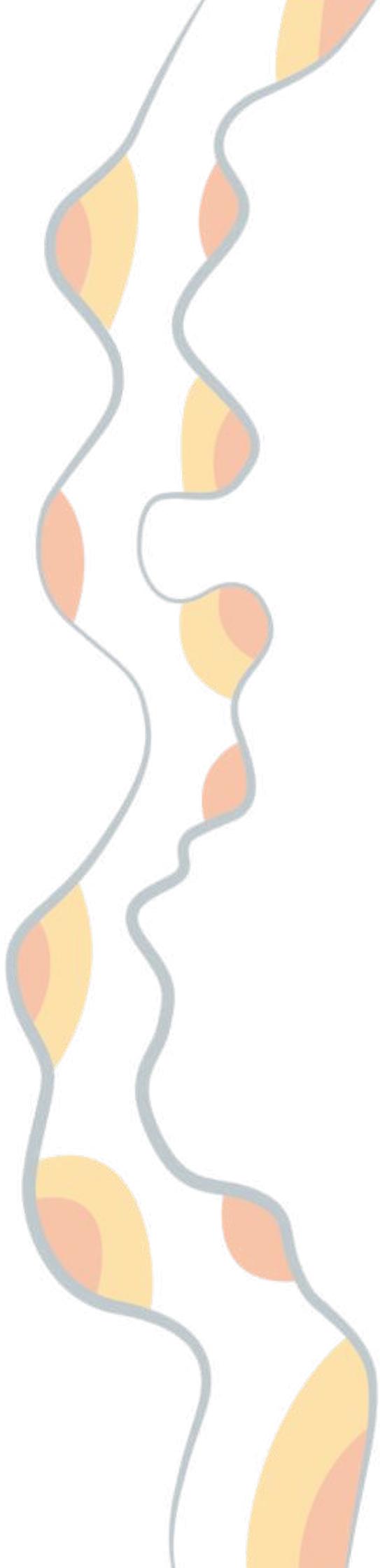
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## Version Control

| Version | Date     | Change log        | Author(s)     |
|---------|----------|-------------------|---------------|
| 0.1     | 30/09/21 | Draft version 0.1 | Mathew Oliver |
| 1.0     | 01/09/21 | Version 1.0       | Mathew Oliver |
|         |          |                   |               |
|         |          |                   |               |



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