PREPARED FOR
PILBARA CORRIDORS (RANGELANDS NRM)

Desktop Study

Weed Priority Sites and Management Action Plan

September 2015

REPORT

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Executive Summary

This desktop study, guided by the Conservation Action Plan (CAP) for the Pilbara Corridors (PCP) Project, identified weed priority sites and suggested a Management Action Plan for implementing a wider monitoring program in the Fortescue Catchment. The PCP has a current monitoring program conducted on a bi-annual basis to fulfill two tasks:

1. assess six sites to determine the reduction / elimination of Weeds of National Significance (WoNs) following treatment; and
2. undertake 'Ecological Monitoring' at the same six sites to contribute to the Federal Government Biodiversity Fund program (Australia wide).

The aim of this desktop study is to highlight areas of known weed infestation and suggest new sites for potential inclusion in an expanded monitoring program. Through the CAP process, key environmental assets across the Pilbara bioregion were identified, key threats to these assets listed and ranked, and goals and strategies created in order to focus environmental action. In acknowledgement of the key strategies pertaining to weeds emanating from the CAP, this desktop study has collated areas where weeds are known to occur, and new candidate areas for future monitoring to evaluate the effect of applied control measures.

Information pertaining to weed location, diversity, habitat and control within the Fortescue Catchment was collated from various sources including the Pilbara Mesquite Management Committee (PMMC), Department of Parks and Wildlife (DPaW) Fortescue Marsh sub-project, DPaW Millstream-Chichester and Karijini National Park staff, Roy Hill Iron Ore, and Astron Consulting.

Out of currently listed 32 WoNs species, five (Opuntia Cactus, Mesquite, Parkinsonia, Rubber Vine and Mimosa) are currently found in the Pilbara bioregion (Department of Environment, 2014). Data showed a wide spatial distribution of several weed species, with the following species widespread throughout the Pilbara region:

- Calotropis (*Calotropis procera*) –mainly contained around the DeGrey / Port Hedland area with East-West distribution towards Newman; along Karratha hills base and in drainage lines;
- Mesquite (*Prosopis glandulosa x P. velutina x P. pallida* hybrid) – this species appeared to be most prolific on Mardie Station;
- Parkinsonia (*Parkinsonia aculeata*) – records tend to be along watercourses, especially along the Fortescue River;
- Bellyache Bush (*Jatropha gossypiifolia*) – exists locally around Karratha and is sparsely distributed areas within the Fortescue Catchment; and
- Cactus (*Opuntia cylindrica*) – much of the known infestations for this species were on Peedamulla Station
- Additional information on past and present records within Millstream-Chichester National Park of infestations of other weeds (including Date Palm (*Phoenix dactylifera*), Morning Glory

(*Merrimia dissecta*) and Stinking Passion Flower (*Passiflora faoetida*) was collated from DPaW staff, with a focus around the Homestead / Chinderwarriner Pool precinct;

- Weed species including Ruby Dock (*Acetosa vesicaria*), Kapok (*Aerva javanica*) and others are being recorded by DPaW staff in Karijini National Park (since 2013), with some undergoing treatment, others not. Overall, this park is not receiving any comprehensive monitoring except for opportunistic collection of records by rangers.

The above data demonstrates that, in places, significant infestations of weeds are present, including a diversity of species, whereas across the Pilbara more broadly, there are areas where weeds are relatively sparse. There is an opportunity to implement realistic and practical actions through a coordinated program, which should aim to:

- minimize further expansion of existing substantial infestations and reduce their extent, where practicable; and
- eliminate small infestations (i.e. isolated or outlying) to prevent further infestation within the Catchment.

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1 Background

The Conservation Action Plan (CAP) for the Pilbara Region, commissioned as part of the Pilbara Corridors Project (PCP), has identified key assets within the Fortescue Catchment in need of focused and targeted environmental actions. Weeds can be considered a threat to biodiversity when populations turn into monocultures and reduce plant diversity, alter community structure and resilience and affect associated fauna habitats. A range of key strategies were outlined during the CAP Workshop Stage 3 such as:

- development of a Pilbara wide weed strategy and action plan led by an extended Pilbara Mesquite Management Committee (PMMC);
- development of a biosecurity strategy and action plan targeted at high risk areas;
- development of an integrated coastal management plan.

The following actions were highlighted with the aim of developing a strategic weed monitoring program:

- develop funding proposal for asset prioritisation and monitoring;
- undertake six months asset prioritisation study;
- monitor for new incursions etc.

Currently the Pilbara Corridors Project undertakes monitoring at six sites within the Fortescue Catchment (**Figure 1**, **Appendix A**). Additionally, over the last 12 years the Pilbara Mesquite Management Committee (PMMC) has accumulated a comprehensive dataset on weed diversity, location of occurrence and the control measures in place (**Figure 1**, **Appendix A**). Furthermore, over the last four years the Department of Parks and Wildlife (DPaW) sub project in the Fortescue Marsh area has gathered additional data on the presence of certain weed varieties (**Figure 2, Appendix A**).

This document presents a collation of this available information on weeds within the boundary of the Pilbara Corridors Project. The information in this study can be used to help inform a strategic weed monitoring program as suggested by the CAP and guide its implementation.

2 Objectives

The overarching goal of this document is to identify priority weed sites in the Fortescue Catchment and guide the development of practical strategies towards the reduction, minimisation and/or elimination of defined weed groups, in alignment with the CAP. More specifically the document seeks to:

- outline key weed types within the PCP boundary;
- define the spatial distribution of these weeds (i.e. both of National significance and those leading to potential threatening environmental status) using readily available data;
- suggest sites where reduction, minimisation and elimination of weeds may be conducted, as part of an ongoing programme, in alignment with CAP goals and strategies.

This document will focus on five of the broad key assets identified during the CAP process:

1. Coastal (sand dunes / offshore islands);
2. Inland Mountain Ranges, Breakaways, Mesas and Rocky Hills;
3. Wetland and Other Water Dependent Systems (rivers / springs / pools);
4. Fortescue Marsh; and
5. Plains asset (Spinifex hummock land systems / Tussock grasslands / Mulga Communities).

3 Weed Sites by Asset

This section presents a summary of known areas of weed infestation for each of the key asset described by the CAP. For each weed, information is presented regarding the location, extent and current control effort occurring.

3.1 Coastal

3.1.1 Mesquite

- Mardie Station: *Prosopis glandulosa* x *P. velutina* x *P pallida* hybrid, extensive population has been under treatment for three years resulting in a reduction in extent, predicted elimination by 2015-2016.
- Mardie Station: Northern coastal boundary with Yarraloola (S 21°08.203', E 115°52.542'; S 21°19.581', E 115°39.268'. DPaW UCL coastal side of the Maitland River (S 20°46.260', E 116°31.371') and 40 Mile Beach (S 20°49.511', E 116°20.806') area.
- Mardie station Chinginarra Paddock (N 76.406444 / E 37.92973). This area has received biocontrol measures / herbicide and mechanical treatment for 3 years with further work planned in August until October 2015. Citic Pacific has allocated 3Million over 10 years under its state offset program to reduce / eliminate the Mesquite population at Mardie. In addition, PMMC and Richard Climas, the station manager provide a yearly distribution of fund allocation.
- Two sites on Chinginarra paddock are monitored bi-annually by PCP staff as part of on-going program (N 76.40831 / E 37.7918 – N 76.40644 / E 37.9281). One site records a total elimination of Mesquite due to intensive mechanical control. Site 3 (N 76.40644 / E 37.9281) carries a dense infestation and is due for treatment in 2015-2016.
- DPaW UCL Coast: Contractors on UCL strip from mid to late October 2015 and May 2016 funded by DPaW using herbicide control methodology.

3.2 Inland Mountain Ranges, Breakaways, Mesas and Rocky Hills

3.2.1 Mesquite

3.2.2 Bellyache Bush

- Previously found at Pannawonica and on Yalleen Station, where a small infestation is now reasonably well contained. None found up until 2015.
- Presence in Karratha City where it is occurs in gardens.

- Bellyache Bush is spread by bird and Aeolian processes and ant movements leading to underground storage capacity.
- Threat: weed propagation through vehicle use, mud deposition, parking under trees and water.
- Danger: Highly poisonous. If consumed by birds and children it leads to fatalities.

3.2.3 Parkinsonia

- Found throughout the entire Pilbara Catchment: DeGrey / Fortescue / Ashburton / Coastal Strips.
- Roy Hill / Millstream Homestead and downstream / Yalleen Station / Railway from Ngurrawaana Community (S 21°29.694' / E 117°05.685') to NW Coastal Highway, with irregular infestations encompassing a 90 km stretch.
- No known records at: Mulga Downs / Mt Florance / Coolawanyah stations.
- Millstream-Chichester National Park (MCNP) one known area: Chindiwarriner Pool or the 'Delta' area.

3.2.4 Calotropis

- Extending from Port Hedland towards Newman through an East-West line across the Fortescue Catchment.
- Presence in Karratha on lower hill slopes throughout. No control measures applied. CSIRO presently researching a bio-control effective treatment.
- Danger: Its ability to turn into a mono-culture and can be toxic to stock if consume the plant in quantity.
- DAFWA / PMMC do not undertake control measures. DAFWA role is purely enforcement based.

3.2.5 Morning Glory

- Areas on Water Corp land adjacent to Millstream Chichester NP have substantial infestations.
- Treatment for this species shows varied success as it carry bulbs underground and is therefore difficult to eradicate. Despite this, there has been a noticeable reduction in size of infestation overall.
- No information to be found about this weed infestation; warrants further investigation.
- Treatment is by spraying with glyphosate. DPaW is presently trialling a few different methods to establish which is most successful.

3.2.6 Rubydock

- Over 90,000 plants. This species is found predominantly around:
- Karijini Drive, Bruce Flat area (S 22°58'240 / E 118°13019; S 22°58'144 / E 118°14'547; S 22°57'488 / E 118°19102; S 22°57'420 / E 118°19'585; S 22°57'380 / E 118°20'380; S 22°57'480 / E 118°21'545);
    - (S 22°57'262 / E 118°30'464) 'the Gap' culvert, North Side;
    - (S 22°56195 / E 118°32'215; S 22°56'151 / E 118°32'875), floodway, north side;
    - (S 22°56'095 / E 118°45'029), home creek;

- (S 22°57’155 / E 118°38’004; S 22°57’194 / E 118°37’949; S 22°57’001 / E 118°37’394; S 22°56’926 / E 118°37227; S 22°56’829 / E 118°37’195; S 22°56’740 / E 118°37’039), Mulga woodlands, north and south of road;
- (S 22°56’844 / E 118°41’116), deep creek;
- (S 22°57’492 / E 118°19’077), floodway and south creek side.

- Dale’s Gorge (S 22°47’820 / E 118°56’136) Three Ways scree slope:
  - (S 22°47’731 / E 118°55’775), cliff face;
  - (S 22°48498 / E 118°57’017), Gordon cliff face;
  - (S 22°47’807 / E 118°56’026), west of 3 ways scree slope;
  - (S 22°47’009 / E 118°55’257), Dingo 66.
- West Banjima Drive (S 22°53’204 / E 118°10’699; S 22°53’233 / E 118.10’612), west of road;
  - (S 22°44’629 / E 11°21’707), west side;
  - (S 22°53’002 / E 118°10’709; S 22°52’819 / E 118°10’858), base of hills;
  - (S 22°52’925 / E 118°10’941) creek line;
  - (S 22°52’898 / E 118°11’195; S 22°52’695 / E 118°11’655), culvert and creek.
- Dinner Plate Hill (S 22°61’212 / E 118°29’190; S 22°61’322 / E 118°28’999; S 22°61’346 / E 118°28’971; S 22°61’355 / E 118°28’944; S 22°61’369 / E 118°28’910; S 22°61’389 / E 118°28’860), scree slope.
- East Banjima Drive (S 22°53’993 / E 118°45’824)
  - (S 22°52’660 / E 118°45’872), Entry station island.
  - (S 22°49’481 / E 118°47’128), Floodway east side.
- Juna Downs Road (S 22°56’064 / E 118°45’267; S 22°56’085 / E 118°45’319), HQ east entry side.
- Vigours Side (S 22°62’329 / E 118°27’553), RTIO report, roadside, woodlands
- The majority of plants are being treated using: Glysophate/Brush off then hand pulled. Dale’s Gorge cliff face, west side of Banjima Drive, west of Banjima Drive base of cliffs and Juna Downs Road area are not treated.

3.2.7 Kapok

- Presence of Kapok found in the vicinity of Dale’s Gorge, Dale’s parking area and Dale’s campground (S 22.47115° / E 118.55305°, S 22.47217° / E 118.55223°; S 22.47138° / E 118.54744°; S 22.47050° / E 118.54744°; S 22.48429° / E 118.49648°), with infestations in the order of 1000’s of plants. Treatment is a mixture of Glysophate/Brush off and hand pulling.
- Extensive visual recognition around rocky habitats in and around Karratha greater vicinity.
- Presence on Bonney Downs (S 22.1069° / E 119.52289°), Hillside Station (S 22.03467° / E 119.19149°) and Corunna Downs (S 21.28340° / E 119.50031°). No treatment.

3.2.8 Date Palm

- Since 2013 recorded at Milli Milli Creek (S 22.78549° / E 118.00943°; S 22.77580° / E 118.02862°) with only two plants sighted.
- Coolwanyah Station (S 21.47574° / E 117.48397°) No treatment undertaken.

3.2.9 Mexican Poppy

- Seen since 2015, one plant at Joffre Creek, Banjima Creek, North of crossing (S 22.40421° / E 118.27101°). Treatment: cut. No follow-up.

3.2.10 Thorn Apple

- Located around the eco-retreat (S 22.38641° / E 118.25882°; S 22.38642° / E 118.25874°), approximately 20 plants. Treated with glysophate: Brush off, poisoned and hand pulled. No monitoring.

3.2.11 Spanish needle

- Nearly 1,000 plants around Weano Gorge picnic area (S 22°35'742 / E 118°28'310; S 22°35'821 / E 118°28'345; S 22°35'721 / E 118°28'318). Treatment: hand pulled. No monitoring.

3.3 Wetland and Other Water Dependent Systems

3.3.1 Parkinsonia

- Presence along the Maitland River (S 20°46.37' / E 116°30.38') and the Robe River (S 21°34.029' / E 115°47.847'). Methods of biocontrol with support from DAFWA in 2015 has released new agent at four consecutive stages on the DeGrey / Maitland and Robe River systems.
- Yalleen Station floodplains (N 7631815 / E 436388,) has an infestation under control with yearly treatment and a bi-annual monitoring program undertaken by PCP staff.
- On the Ngurrawaana Lease along the Fortescue River, Parkinsonia can be found in significant numbers. One site (N 7623118 / E 482777,) is monitored bi-annually by PCP staff and controlled by the Ngurrawaana Rangers Team yearly. Extensive chainsaw and Garlon herbicide treatments have taken place since 2010. Revisiting of treatment sites and herbicides applications to resume in 2015 by the rangers. 2015-2016 will see further control measures, both chainsaw and herbicides methods used by the Rangers Team under a State NRM Grant fund.
- Millstream-Chichester National Park (MCNP) one known area: Chindiwarriner Pool or the 'Delta' area (S 21°33.758' / E 117°05.776')

3.3.2 Stinking Passion Flower

- Prior to 2014 it had never been treated. Treatment trials start December 2014 with positive results. Continue on with treatment program in January 2015. Locations: Chinderwarriner Pool / Homestead precinct (S 21°33.758' / E 117°05.776').
- In March 2015, Ngurrawaana rangers were employed to control weed around Chinderwarriner pool using 'scrape and point' method. Trials were successful using a method of 100% glyphosate manually applied to a cut and scraped vine stem.
- September 2015: follow up treatment completed in previously surveyed and treated area resulting in a 75% reduction or more with *Passiflora* cover of 5%. Treatment success in

various areas scored between 75% to 25% but with all results showing plant cover reduced to 5%.

- One site was treated by using prescribed burn method on Water Corporation land and to this day, Sep 2015 it seems to be working. All sites are monitored on a quarterly basis.

3.3.3 Date Palm

- Intensive program since the late 1980's with machinery used in the early 90's to pull date palm out of the ground following big fire in Chinderwarriner Pool area in 1995.
- Treatment changed to Diesel/Garlon mix sprayed into cut stems of smaller plants and sprayed into trunks of larger trees post chainsaw cut. So far a successful treatment.
- A six week program is funded annually and undertaken by the Ngurrawaana Rangers.
- The program carries on until 2017-18 from eradication to maintenance due to significant reduction.

3.4 Fortescue Marsh

3.4.1 Parkinsonia

- The infestation of Parkinsonia at this location is not as substantial compared to other locations on Roy Hill Station (PMMC, pers comm.). Contractors are funded annually by PMMC to manage the infestation.
- DPaW staff, in conjunction with Fortescue Metals Group (FMG) have applied measures, mostly herbicides, within the Marsh. Most of the plants are located around: Kulbee Claypan / 8 Mile Pool / along Fortescue River / Roy Hill G12 / Yarree Spring / between Ponderumba Pool and Great Northern Highway south of the homestead.
- A survey in 2014 by DPaW-FMG staff for Roy Hill Station documented the presence of various weed species including Kapok, Ruby Dock, Buffel Grass, Calotropis, Mexican Poppy and others.
- Two sites on Roy Hill Station, one on FMG Roy Hill tenement (N 7500227 / E 800200,) and another on Roy Hill Mining group (N 7499933 / E 804310,) have Parkinsonia at varying degrees of propagation. FMG Roy Hill site has a significant infestation along the river banks and control measures are to start in 2015. Roy Hill Iron Ore site has undergone treatment yearly and the presence of Parkinsonia is minimal. Both sites are monitored bi-annually by PCP staff.

3.5 Plains

3.5.1 Bellyache Bush

- Previously found at Pannawonica and on Yalleen Station where a small infestation is now reasonably well contained. None found up until 2015.
- Karratha city sees evidence of it inadvertently grown in gardens: Nickol Bay Flat (VLA2015) and along drainage lines.
- Bellyache Bush is spread by bird and Aeolian processes and ant movements leading to underground storage capacity.

- Threat: weed propagation through vehicle use, mud deposition, parking under trees and water.
- Danger: Highly poisonous. If consumed by birds and children it leads to fatalities.

3.6 Outside PCP Boundary

Data collated by PMMC has focused on Calotropis, Parkinsonia, Mesquite, Cactus and Bellyache Bush and survey work and control measures have focused on areas within Pilbara Corridors Project boundary (i.e. the Fortescue Catchment). Below is a synopsis of additional data for weed species found at various locations within the wider Pilbara region.

3.6.1 Mesquite

- Is found on the Cane River Swamp (S 22°05.182' / E 115°38.997') in small numbers. Is present in limited extent on Peedamulla Station (S 21°51.908' / E 115°33.128'). Minderoo (S 21°59.313' / E 115°06.760') and Urala (S 21°45.587' / E 114°48.429') Stations have infestations of broad extent. On Minderoo, an East to West transect is covered with mesquite (undergoing treatment for two years).
- Yarraloola Station has an infestation to the north, adjacent to Mardie Station boundary. Numbers are relatively low due to ongoing control over several years.
- Karratha Station has a low density but a significant extent on the DPaW UCL coastal strip extending to the Maitland River (S 20°51.768' / E 116°37.873') and 40 Mile Beach (S 20°49.511' / E 116°20.806'). Wallareenya station (S 20°44.725' / E 118°48.176'), south of Hedland has a dozen trees PMMC has treated in 2014-2015, yet still needs to be controlled and monitored. DeGrey station has a small and concentrated presence, PMMC will be eliminating in 2015-2016.

3.6.2 Bellyache Bush

- Reported sightings on Yarrie Station to be verified by PMMC in 2015.

3.6.3 Parkinsonia

- Found in the Ashburton and DeGrey districts. Munda station operates a yearly treatment. The Robe River infestation along Yarraloola homestead vicinity downstream of fluvial system is co-managed by RTIO and PMMC.
- Peedamulla Station has small numbers in Kanca Creek (S 21°51.728' / E 115°30.329'), possibility of control in 2015-2016. Presence along the Ashburton River / Minderoo homestead (S 21°54.584' / E 115°02.697') all the way to the coast. Urala station (S 21°45.587' / E 114°48.429') carries a reasonable quantity which receives yearly treatment: chemical and mechanical-chemical actively in place.
- Mt Welcome Station has never been treated. Sparse occurrence around Woodbrook homestead (S 20°54.568' / E 117°07.672') downstream through to Roebourne to the Coast, totalling around 20 km of river. PMMC has offered to support Mt Welcome once managers are willing to commit.

3.6.4 Calotropis

- Linear infestation from Port Hedland towards Newman.

3.6.5 Cactus

- Peedamulla Station bears the worst infestation in the Pilbara region. On-going basis treatment from managers and PMMC using water (H_2O) and herbicides. Control so far is successful but in need of repeat. The outer leaves has been tackled, in order to eliminate plants the core needs further measures. PMMC funding in 2015 has 8k left. Further funding and resources are essential to reduce and / or eliminate cactus on Peedamulla.
- The Cane River Nature Reserve managed by DPaW treatment is under control.
- Wallareenya Station has had two treatments. Initial control around Homestead Creek is in need of revisiting.
- Turner River on Wallareenya Station needs further treatment – FMG / Iron Hill Railway line has a small infestation which receives treatment but only south of the line. Around the mining camp no control is applied. This could be revised in the near future so as to avoid spread of cactus in the vicinity.

4 Current Activities

The CAP workshop process highlighted control measures that are currently in progress in the Pilbara region. These are listed in the table below.

Asset	Activity
Coastal	• CSIRO trials on Prickly Pear control (Rosemary Island) • Greening Australia community project in Port Hedland (Buffel grass reduction on dunes) • Gorgon project: develop biosecurity program for offshore islands • DPaW prioritisation project for islands control • DPaW cactus control
Inland Mountain Ranges, Breakaways, Mesas, Rocky Hills	• CSIRO developing climate change modelling / risk assessment report • Official list of weeds and priority targets in process • PMMC on-going control in the Pilbara (funds dependent) • Indigenous ranger group (Ngurrawaana) control of *Parkinsonia* • Mining offsets on some tenements • PEC / NOONE monitoring *Passiflora* extent on the Burrup Peninsula
Wetland and Other Water Dependent Systems	• PMMC on-going control in the Pilbara (funds dependent) • Active management by pastoralists • DPaW regional prioritisation report • Ngurrawaana rangers treatment of *Parkinsonia* along Fortescue river on Leramugadu lease • Action from DPaW: map *Passiflora* at MCNP using data to locate priority areas and treat those locations. Request for funding.
Fortescue Marsh	• PMMC contractors bi-annually treating *Parkinsonia* on Roy Hill Station • DPaW-FMG treatment of *Parkinsonia* (Hamish Robertson)
Plains	• Citic Pacific environmental offset on Mardie Station (Mesquite) • PMMC control throughout Pilbara region

	(PMMC/PCP/CITIC/RTIO/DPaW) • Ngurrawaana rangers (*Passiflora* / date palms / *Parkinsonia*) control on MCNP and Leramugadu Lease • CSIRO bio-control: *Parkinsonia* / Mesquite on Fortescue Station • Monitoring six sites by PCP staff at four stations within Catchment • Atlas Iron weed strategy • Karratha environmental group activities in Karratha

5 Identified Issues

Key issues identified during the conduct of this desktop study that warrant further attention are listed below:

- uncertainty / absence of knowledge of specific areas where weeds (and their types) are in the Fortescue Catchment;
- inability to access funds for weeds other than WoNS or those that are on the DAFWA list of species to treat / manage / gather information;
- difficulties with data sharing between PCP / PMMC / DAFWA Mining companies;
- potential unwillingness from mining companies and station managers / owners to treat their weed populations due to various factors (e.g. time, cost, impracticality, not seen as an issue, not part of environmental offset program);
- possible conflict of interest with stations managers / owners and mining groups in passing information or undertaking research on their leases.

5.1 Recommended Future Actions

In acknowledgement of the issues above, some actions warrant prioritisation to facilitate the establishment and implementation of an effective weed control strategy:

- conduct on-ground or satellite imagery surveys through the Fortescue Catchment in already-identified areas of weed populations to assess extent and quantity;
- revisit all existing Ecologically Sustainable Resources Management (ESRM) Plans within the Fortescue Catchment (and potentially across the Pilbara region) and collate any information on weeds;
- instigate discussions with stations owners / managers and mining companies to collate information on weed species occurrence and extent of infestation in collaboration with DPaW, PMMC and Astron Environmental.
    - Contact Balfour, Bonney Downs, Bulloo, Ethel Creek, Hamersley, Hillside, Hooley, Marillana, Noreena Downs, Prairie Downs, Sylvania, Walagunya, Weelarrana to investigate presence of WoNs and feasibility of developing projects for treatment; to be developed in collaboration with PMMC (likely contracted to manage projects);
- increase the number of regularly monitored sites, establish new monitoring sites on the conservation estate (i.e. MCNP / KNP / Cane River / UCL managed by DPaW);
- approach stations where WoNS have been recorded outside of PCP boundaries to investigate which ones are willing to be involved in undertaking weed control;

- maintain involvement and awareness of the DPaW “grid system monitoring program” for the Fortescue Marsh for 2016;
- map the entire Chinderwarriner Pool / Homestead precinct area (MCNP) for stinking passion flower (*Passiflora*) prior and subsequent to treatment to assist with costing estimates over long-term for control methods and outcomes, in collaboration with DPaW MCNP staff;
- Establish a monitoring program for weeds of relevance within Karijini National Park, in collaboration with DPaW staff.

6 Pilbara Corridors Monitoring Programme

6.1 Proposed new monitoring sites – summary

This section outlines possible new monitoring sites that could be established in areas where management is taking place within the PCProject boundaries to better monitor the effectiveness of weed control measures across the Catchment. Candidate sites for inclusion in the monitoring program are listed below and rationale for their inclusion presented in **Section 6.2**:

- Mardie Station – Chinginarra paddock;
- Yalleen Station – along floodplains;
- Millstream-Chichester National Park;
- Roy Hill – FMG tenement;
- Ngurrawaana Lease – Along Fortescue River in conjunction with Rangers Team;

There is a possibility to extend the monitoring program to include areas outside of the Fortescue Catchment. This could include sites such as Peedamulla, Robe River, Cane River, Mt Welcome, Urala, Karratha Station, Wallareenya Station and Fortescue Marsh.

6.2 Proposed new monitoring sites – detail

This section contains data on potential monitoring sites for inclusion in a broader monitoring program, both within and outside the perimeters of the Pilbara Corridors Project boundary (i.e. Fortescue Catchment). The rationale for the inclusion of these sites has been guided by consultation with PMMC, Astron Environmental, DPaW (MCNP and KNP Rangers).

4.1.5.1 Coastal

Asset	Weed species	Location	Justification	Priority	Within Fortescue Catchment
Coastal	Mesquite	Mardie Station, coastal strip boundary with Yarralloola Station	• Severe infestation; • Extensive treatment not currently monitored. Effectiveness of treatment and efficiency of spending funds can be better assessed with long term monitoring for this hybrid species which is proving difficult to control	Short Term	Yes
		Boundary of Karratha Station and DPaW UCL coastal strip (onto 40 Mile Beach and Maitland River)	• Is receiving treatment by Rio Tinto Iron Ore, not currently monitored.	Short Term	Yes
		Extend Mardie/Yaralloola boundary monitoring along coast	• To establish the effectiveness of control treatment across a wider extent.	Longer Term	Yes
		Expand Karratha Station/DPaW UCL monitoring	• To establish the effectiveness of control treatment across a wider extent.	Longer Term	Yes
		Mardie Station: a./ N 76598434 / E 4048669 b./ N 76656567 / E 4056311	• a. / this area is supposed to be "clean" of Mesquite but it is adjacent to where a spreading front of MQ has been recently recorded. • b. / this site looks like it might be in UCL/ Heritage area? Need to ground truth this site. Uncertainty as to presence. Potential restriction due to mining operations – Useful to have a site on non-pastoral lease land around Mardie.	Longer Term	Yes
	Parkinsonia	Sites on DPaW UCL coastal strip	• To establish the effectiveness of control treatment across a wider extent.	Longer Term	Yes
Inland Mountain Ranges, Breakaways,	Calotropis	Potential sites on PCP stations: Ethel Creek / Marillana / Hillside /	• To establish occurrence, abundance and extent of infestations, representing a starting	Short Term	Yes

Mesas, Rocky Hills		Bonney Downs	point towards expanding monitoring to these Stations to better inform a regional strategy.		
	Parkinsonia	Millstream Chichester NP / Leramugadu Lease	• To guide control and effective allocation of funds for Ngurrawaana rangers (via DPaW and as fee for services) to continue treatment	Short Term	Yes
		more monitoring sites along river	• Gauge treatment progress at existing infestations where control is undertaken	Short Term	Yes
		Booloma Pool. Just downstream from the rail, near to the existing site. N 76656567 / E 4056311	• Presence has been recorded there but not treated (Plans to treat in 2016).	Short Term	Yes
		Yalleen Station – a. / Near Fortescue river bridge on NWC highway. N 76406975 / E 4213388 – b./ Nearby Fortescue river bridge – N 76409734 / E 4106296	• a. / No records of presence at this location and no treatment, but plants recorded upstream - the area should be a "clean site". • b. / Plants have been treated for 3 consecutive years (2013- 2015) but not monitored.	Short Term	Yes
	Calotropis	Infestation between Port Hedland and Newman.	• Investigate areas of priority / expansion of population • Gather knowledge on where best to prevent future infestation	Longer Term	Yes
	Morning Glory	Miliyanha Campground, MCNP	• To monitor the reduction in infestation size through time	Longer Term	Yes
Wetland and other dependent systems	Parkinsonia	Extend program along Fortescue River on Leramugadu Lease (MCNP), Roy Hill and Yalleen Stations	• To provide effective monitoring of treatment by Ngurrawaana community rangers / PMMC Contractors (i.e. more than one site monitored per station).	Short Term	Yes
		River systems in Newman and surrounds	• Lack of data; possible infestations not receiving any control. • Risk of on-going expansion	Short Term	Yes
	Passiflora	Chinderwarriner Pool / Homestead area	• To investigate most effective treatment methods and timing with respect to fire	Short Term	Yes
	Parkinsonia	Leramugadu Lease / MCNP / Roy Hill	• Collate a comprehensive database for presence and density along Fortescue River • Develop a catchment map with extent and density of weed infestations to guide funds allocation for DPaW / Indigenous ranger	Longer Term	Yes

			groups		
		Chinderwarriner Pool	• To investigate extent within the park and assess effectiveness of previous treatment	Longer Term	Yes
	Date Palm	'Delta', Chinderwarriner Pool area	• Long term monitoring (i.e. since 1980s) has guided. • Establish monitoring to assist with mapping remaining trees to eradicate, more effectively guide investment	Longer Term	Yes
Plains	Parkinsonia	Roy Hill station - a./ N 75092495 / E 7851617 b./ N 75033488 / E 7934194	• a. / no plants recorded at this site, however, site nears a Cattle yard adjacent to the marsh and west of the area where presence occurs. Higher potential risk for invasion through seeds dispersion from cattle movement. • b. / this site is located at the western end of the extent of Parkinsonia and its treatment area (14 mile pool). Parki has been recorded and treated here - Repeat treatments scheduled for 2016.	Short Term	Yes
		Roy Hill station - a./ N 74971479 / E 8040362 b./ N 74838831 / E 199584	• a. / near the homestead and in the areas where plant is treated. • b. / high invasion risk: The site is east of the known extent and treatment area.		Yes
Coastal	Mesquite	Urala Station	• Set up monitoring on more prolific sites where treatment is taking place • No monitoring at present.	Short Term	No
		Urala Station and offshore islands	• Extensive infestation. • Mechanical and chemical treatment not measured at present.	Longer Term	No
	Cactus	Peedamulla Station	• Set up monitoring on more prolific sites where treatment is taking place • No monitoring at present.	Longer Term	No
Inland Mountain Ranges, Breakaways, Mesas, Rocky Hills	Parkinsonia	Munda Station	• Set up monitoring on where treatment is taking place • No monitoring at present.	Short Term	No
		Kanga Creek (Peedamulla Station)	• Small, contained infestation	Short Term	No

			• Determine necessary fund allocation for treatment and monitoring to prevent future infestation		
	Kapok bush / Ruby dock	Burrup Peninsula rock piles	• PEC and NOONE is monitoring, yet further investigation and mapping extent / abundance still required.	Longer Term	No
Wetland and other dependent systems	Parkinsonia	Maitland River and Cane River	• Set up monitoring on where treatment is taking place • No monitoring at present.	Short Term	No
		Robe River	• Set up monitoring on where treatment is taking place • No monitoring at present.	Short Term	No
		De Grey LCDC (sites TBD)	• Assess infestations and establish requirement for treatments, secure funding	Short Term	No
	Mesquite	Maitland River and Cane River	• Set up monitoring on where treatment is taking place • No monitoring at present.	Short Term	No
		Robe River	• Set up monitoring on where treatment is taking place • No monitoring at present.	Short Term	No
		De Grey LCDC (sites TBD)	• Assess infestations and establish requirement for treatments, secure funding	Short Term	No
	Cactus	Cane River Nature Reserve (swamp)	• Small habitat under control. • No monitoring to assess growth of infestation.	Longer Term	No
		Wallareenya station (Turner River area)	• Set up monitoring on where treatment is taking place • No monitoring at present.	Longer Term	No
	Passiflora / buffel / birdwood / Mexican poppy	Strong presence at Robe river camping (Parlipuni – Pannawonica Hill) and other coastal and inland tourist campsites.	• An inventory of weed types / extent / abundance to gage what is spreading, how far and where in the Pilbara through tourist traffic. Note its effect downstream of locations	Longer Term	No
Plains	Mesquite	Minderoo Station	• Set up monitoring on where treatment is taking place (3rd year of control) • No monitoring at present.	Short Term	No

		DeGrey and Wallareenya Stations	• Small infestation receiving treatment. • Establish monitoring to assess effectiveness of treatment, potential expansion of infestations	Longer Term	No
	Cactus	Peedamulla Station	• Largest infestation in the region • Control and monitoring yet to commence	Short Term	No
	Parkinsonia	Mt Welcome Station (Woodbrook Homestead to Roebourne)	• Preventative control of infestation required. • Establish monitoring upon commencement of control	Short Term	No
		Minderoo homestead Upstream Ashburton River (Urala station).	• Control of infestation required. • Establish monitoring upon commencement of control	Longer Term	No

Appendix A – Maps

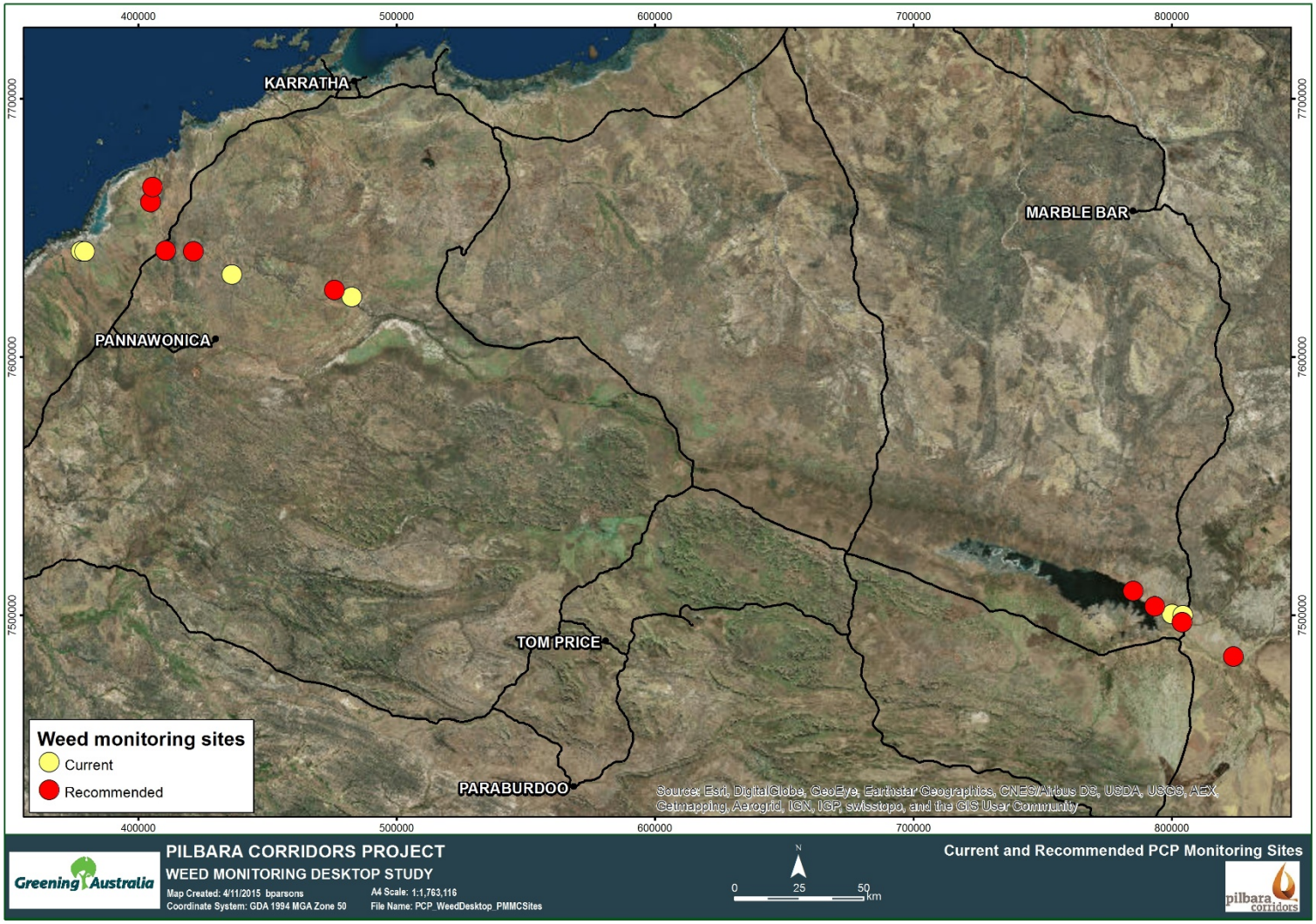

Figure 1: Location of current and recommended (PMMC) weed monitoring sites surveyed as part of the Pilbara Corridors Project.

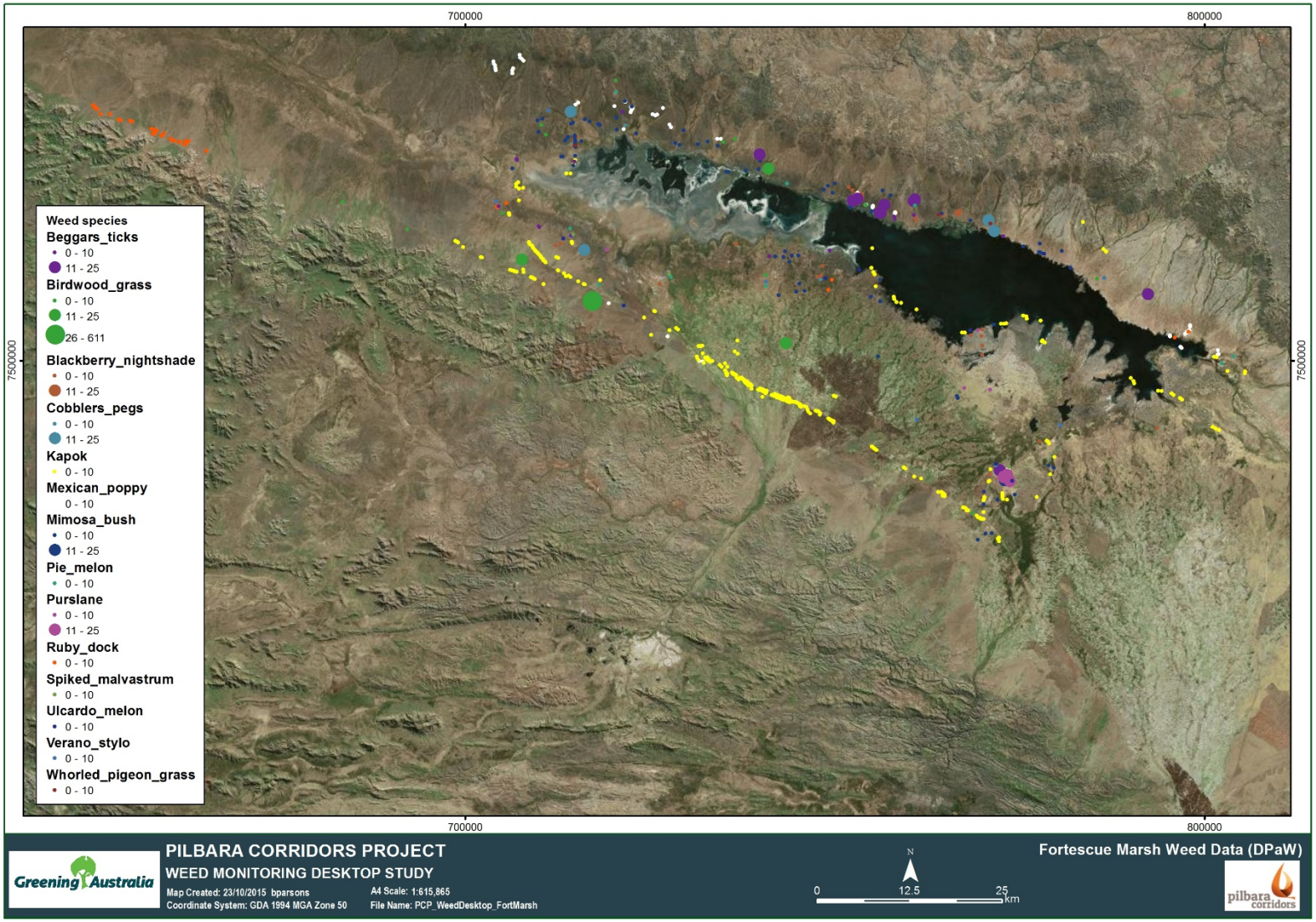

Figure 2: Known locations of weed infestation in the Fortescue Marsh (DPaW)