

CHARLES DARWIN UNIVERSITY

Palmerston campus

**WEED MANAGEMENT PLAN
(2018 management season)**

Part A

1. Executive Summary

Charles Darwin University (Palmerston campus) owned section 4244(?) is located approximately 15 kilometres from the Darwin CBD and occupies a total of approximately 40 hectares. Weeds, and in some areas potentially fire management, present issues for maintaining integrity at this site with issues evident on site at inspection during late March 2018.

Little Falcon Consulting presents an integrated strategic weed management plan detailing aims and objectives in addition to providing recommended actions for the 2017/18 weed control season.

For the purpose of developing, implementing and updating this plan the project site was surveyed and mapped in March 2018. Weed distribution data and notes taken during this assessment/survey have been used to formulate this weed management plan.

Fuel loads and/or firebreaks were not assessed during this survey however it was noted that no compliant firebreak was in place on the eastern boundary and that areas of potentially high fuel loads also exist in close proximity to adjoining properties.

Management objectives suggested include the eradication of target species (specific grasses) in areas immediately adjoining property boundaries and the containment/reduction of other "internal" infestations in order to reduce the likelihood of spread and further establishment within the property. Some minor areas of other species including the declared species such as snakeweed (*Stachtarpheta* spp) and neem trees (*Azadirachta indica*) are also identified as short term eradication targets.

To achieve these objectives a range of specifically timed actions are suggested focussing on the implementation of targeted late wet season chemical control programs prior to flowering/seeding in order to remove and reduce existing grass weed populations and prevent the further establishment of weeds and subsequent build-up of fuel loads in specific areas.

2: Introduction:

The aim of this weed management plan is to reduce the impact(s) of gamba grass and other introduced grasses on Charles Darwin University Palmerston campus, prevent any reestablishment of these grasses and provide an operationally based document that will assist in guiding on-ground management in order to reduce and mitigate the impacts and risks associated with unplanned fire. In addition to this this document also provides a recommendation to eradicate small infestations of other specific declared weeds prior to further spread and establishment.

As such this document provides:

- An outline of the distribution and density of all target weeds found on Charles Darwin University Palmerston campus.
- A listing of the key risks and legislated management obligations that are relevant to the current and potential weed management status of Charles Darwin University Palmerston campus.

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Perennial Mission grass: - declared a Class B/C weed (growth and spread to be controlled)

Annual Mission grass: - NOTE this species is not declared in the NT.
- high fuel load risk: NT Fire and Emergency Regulations (Section 4: accumulation of combustible material).

4: Key Risks and Considerations:

The observed key risks and/or considerations associated with Charles Darwin University Palmerston campus includes the requirement to manage the declared weeds gamba grass, perennial mission grass, snakeweed and neem trees.

In addition to this there is the requirement to establish compliant firebreaks around the boundary of the block and manage the accumulation of excess fuel loads which at this site occur concurrently with infestations of the fore-mentioned grass species.

Gamba grass and perennial mission grass are both declared weeds (growth and spread to be controlled) under the NT Weeds Management Act and are found on a number of areas on this site. Under this legislation, as a minimum, established infestations of gamba grass and perennial mission grass must be contained and isolated plants must be prevented from further establishment.

At Charles Darwin University Palmerston campus these introduced species also have the potential to result in fuel loads accumulating to high levels in high risk areas particularly located along boundaries. This could occur on Charles Darwin University Palmerston campus if areas are not managed as suggested for emerging target grass growth. This issue, along with annual native grass growth, results in the on-going requirement to manage fuel loads as is required under NT Fire and Emergency Regulations where section 4 states that fuel loads must not be allowed to accumulate in a way that constitutes danger by fire.

5: Weed survey results, discussion and recommendations: CDU Palmerston campus.

Area A is located in the northern area of the site and is comprised of an open managed drain area and a number of small remnant areas of woodland in the eastern part of the site.

The western part of Area A was found to be affected by a number of gamba grass infestations located along the southern edge of the drainage line adjacent to the school. Along the north edge of this area a number of neem trees were also recorded. In the eastern part of Area A the four small remnant woodland areas (Areas A1, A2, A3 and A4) were found to be significantly affected by a mix of gamba grass, perennial mission grass and annual mission grass in addition to small numbers of adult and juvenile neem trees. Several small infestations of snakeweed were also recorded within the drainage line at the western edge of this area.

It is recommended that all gamba grass sites in the west of this area along the drainage line are treated as high priority eradication targets in the immediate future. The small infestations of neem trees and snakeweed should also be treated as eradication targets due to their current small size. It is recommended that target grass weed infestations found in Areas A1, A2, A3 and A4 are contained and reduced in order to reduce the risk of further spread around the overall campus site.

Area B is located to the north of the main infrastructure of Charles Darwin University Palmerston campus and is comprised of the lake, the mown/managed areas surrounding the lake and a small woodland site in the north western corner.

During survey no declared plants were observed or recorded within the confines of the lake. Survey of the lake edge resulted in the recording of a number of small perennial mission grass sites plus 2 gamba grass plants. Further to the west the small area of woodland located (Area B1) at the western corner of this area was observed during survey to be affected by a high density infestation of gamba grass.

It is recommended that the gamba grass infestation found in Area B1 is pushed back from mowed edges in order to reduce the likelihood of further inadvertent spread around the overall campus. It is recommended that the small grass weed sites found around the lake edge are eradicated with a spot foliar treatment of a glyphosate product registered for use in aquatic areas.

Area C is located on the north eastern, eastern and southern part of the site and is comprised primarily of native woodland.

Survey of Area C indicated that overall this part of the campus is relatively clean and weed-free with the exception of several gamba grass infestations of note being recorded in the north eastern corner of this area on either side of the drainage line which enters from the east.

Area C1 and C2 which are located in the north western and southern parts of the area respectively were found to be affected by a range of target grasses and other weed species. Area C1 was found to be affected by a number of significant infestations of the priority weed gamba grass. In addition to this several neem trees were also recorded at this part of the site. Similar to this Area C2 was also found to be affected by a significant area of gamba grass along the edge adjoining University Avenue along the southern boundary of the campus.

It is recommended that all gamba grass infestations found within Area C are treated as eradication targets in the immediate future prior to further establishment due to their current small size and risk for further spread and establishment due to their location.

Area D is located in the southern and south western corner of the site and is comprised of a relatively large woodland area in addition to a number of smaller remnant patches of native vegetation.

Survey of Area D indicated that a number of patches of gamba grass are found on Areas D1, D2, D4 and D5 in addition to relatively widespread areas of annual and perennial mission grass. Neem trees were also recorded in Area D1, D4 and D5 noting that the seed source for these appears to be located in Area D1 in close proximity to the chiller plant.

It is recommended that all gamba grass infestations found in Area D1 are pushed back a minimum of 10 metres from the edge of mown areas in the short term to minimise the risk of further spread around the campus. It is also recommended that the large mature neem trees (apparent site seed source) are treated immediately also in order to prevent further seed production and broader spread and establishment. It is recommended that each gamba grass site found within Areas D2, D3 and D4 are treated in their entirety in order to prevent further establishment and subsequent spread risk. In addition to this it is recommended that infestations of annual and perennial mission grasses found around the perimeter of each management

area and along the small drainage line laying to the west of D4 are pushed back from the edge of woodland in the short term in order to again reduce further spread across the overall site.

Table 1: CDU Palmerston campus: summary of weed survey results March 2018.

Site name	Weed survey results
Area A	The western part of Area A is affected by scattered patches of gamba grass and small areas of neem trees found along the southern edge of the drainage line. Isolated neem trees are found along the northern edge of this drainage line. Several small areas of snakeweed were recorded at the eastern end of the drainage line near areas A2 and A3.
A1	This area was found to be affected by a mix of target grasses including gamba grass, perennial and annual mission grass in addition to a single adult neem tree. Grass weed density is estimated at 50%. A limited level of seeding was occurring at this site at assessment.
A2	This area is affected by a mix of target grasses including gamba grass, perennial and annual mission grass at a density estimated at 25%.
A3	This area is dominated by a mix of grass weeds including gamba grass and perennial and annual mission grass. Density is estimated at 50%. A small patch of adult neem trees are also found at this site.
A4	This area is dominated by gamba grass at an estimated 25% density across the site. Scattered juvenile and adult neem trees are also found as indicated.
Area B	Area B is comprised of the lake edge. This area was found to be affected by scattered patches of perennial mission grass in addition to several single gamba grass plants.
B1	Area B1 is the woodland to the west of the lake. This area is affected by medium density gamba grass at an estimated density of 50%.
Area C	The majority of the woodland comprising Area C was found to be clean with the exception of the northern area adjacent to the drain entering from the north east corner of the campus. Several substantial gamba grass patches were recorded in this area covering approximately 4000 m ² in total with density ranging from 25% - 75%.
C1	C1 is the area of woodland immediately to the north of the main campus carpark. This area was found to be affected by a mix of target grasses estimated at a density of 25% overall. In addition to this three specific gamba grass infestations were recorded and two small neem tree sites.
C2	C2 is the area immediately adjoining University Avenue at the southern edge of the campus. Assessment indicated that this area is affected by a significant infestation of mixed target grasses across much of the site. More specifically the southern edge of this site, adjoining the road easement, is affected by a high density gamba grass infestation
D1	Area D1 was found to be affected by a mix of annual and perennial mission grass around the majority of the edge(s). Several small patches of gamba grass were also recorded along the edge of this site with no areas visible further in to the woodland. More significant patches of gamba grass were recorded at the north eastern part of this site in addition to small infestations of neem trees to the south west and west of the chiller plant.

D2	Area D2 was found to be clean with the exception of a single gamba grass plant (as indicated)
D3	Area D3 is affected by juvenile annual and perennial mission grass estimated at 10 % density
D4	Area D4 is affected by a mix of target grasses estimated at an average density of approximately 25%. At this site four specific infestations of gamba grass were recorded in addition to small areas of neem trees at two separate locations within the area.
D5	Area D5 is affected by a mix of target grasses estimated at an average density of approximately 25%. A relatively small area of gamba grass was noted at this site covering approximately 200 m ² in addition to a single juvenile neem tree.

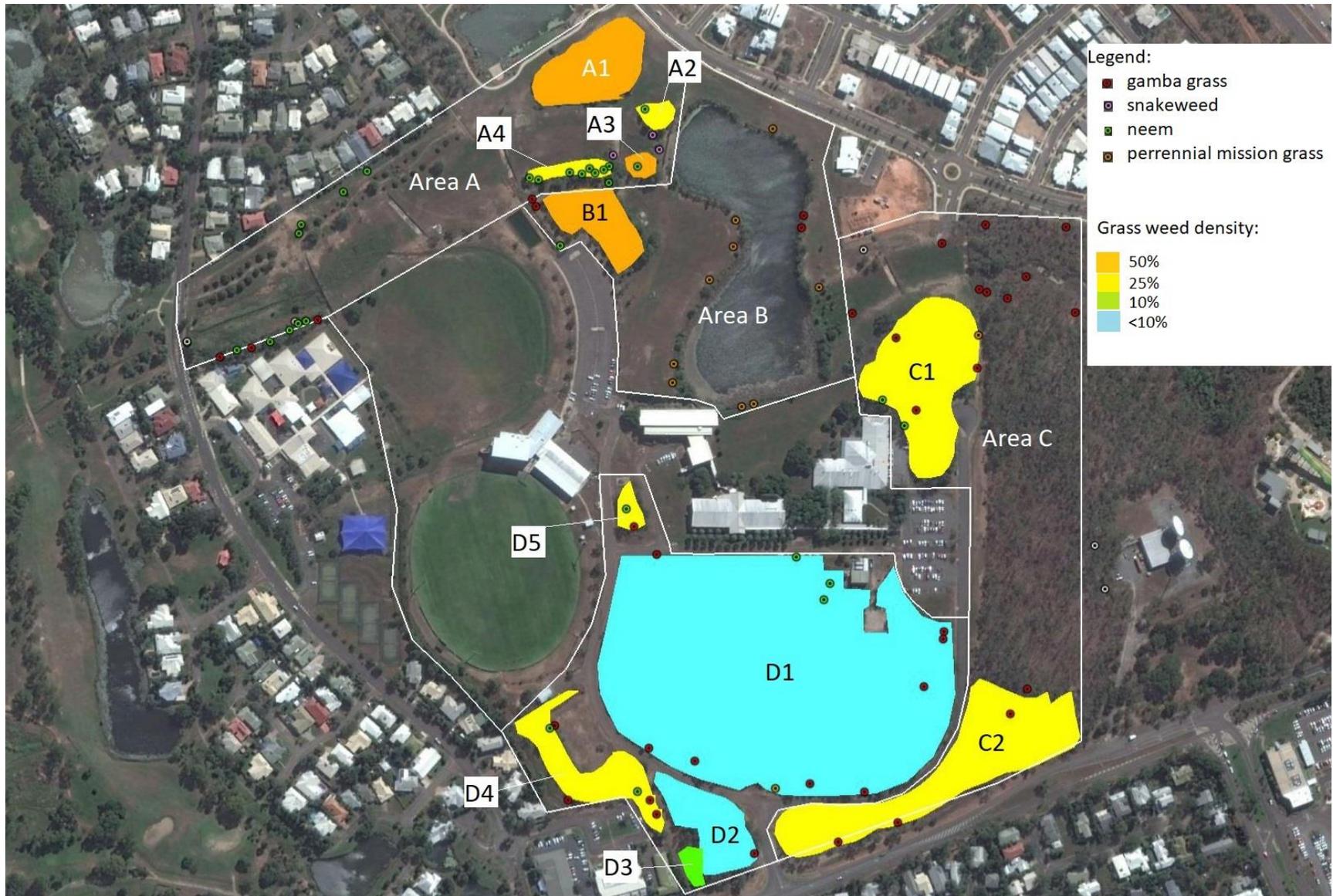


Figure 2: Charles Darwin University, Palmerston campus (indicating all management areas and weed location/density).

Table 2: CDU Palmerston campus: weed management aims and objectives 2018 management season.

Area	Objective(s)	Management actions required	Milestones	Management tools
Area A	Eradication of gamba grass Eradication of snakeweed Eradication of neem trees	Treatment of all gamba grass (and other target grasses) prior to flowering/seeding. Treatment of all neem trees and snakeweed sites prior to maturity.	Seeding prevented in all target species	Foliar application of glyphosate (grasses) Basal bark application of Access and diesel (trees)
Area A1, A2, A3 & A4	Containment of gamba grass and other target grasses. Eradication of neem trees	Treatment of all gamba grass (and other target grasses prior to flowering/seeding) at the edges of each site as a minimum. Treatment of all neem trees prior to maturity.	Seeding prevented at the edge of established infestations Neem trees prevented from maturity	Foliar application of glyphosate (grasses) Basal bark application of Access and diesel (trees)
Area B	Eradication of gamba grass and perennial mission grass	Treatment of all gamba grass and perennial mission grass prior to flowering/seeding.	Seeding prevented	Foliar application of Roundup Biactive (registered for use in aquatic areas)
Area B1	Containment of gamba grass and other target grasses.	Treatment of all gamba grass (and other target grasses prior to flowering/seeding) at the edge of the site as a minimum.	Seeding prevented at the edge of established infestations	Foliar application of glyphosate (grasses)
Area C + C1 & C2	Eradication of gamba grass	Treatment of all gamba grass prior to flowering/seeding.	Seeding prevented	Foliar application of glyphosate (grasses)

Area	Objective(s)	Management actions required	Milestones	Management tools
Area C + C1 & C2	Containment of all other target grass	Treatment of all other target grasses prior to flowering/seeding.	Seeding prevented at the edge of established infestations.	Foliar application of glyphosate (grasses)
Area D1, D2, D3, D4 & D5	Eradication of gamba grass Eradication of neem trees	Treatment of all gamba grass prior to flowering/seeding. Treatment of all neem trees prior to maturity and/or further seed production	Gamba grass prevented from seeding. Neem trees prevented from maturity and/or further seed production.	Foliar application of glyphosate (grasses)
Area D1, D2, D3, D4 & D5	Containment of all other target grass	Treatment of all other target grasses prior to flowering/seeding.	Seeding prevented at the edge of established infestations	Foliar application of glyphosate (grasses)

Table 3: Treatment calendar: CDU Palmerston campus

Target	Timing of treatment	Objective	Milestone
All target grasses (all areas)	Pre-seeding (end of April)	Prevent seed production	- Initial treatment completed prior to seed production - follow up treatment completed prior to seed maturity (seed drop)
Snakeweed and <i>Hyptis</i> (all areas)	Mid flowering	Prevent further seed production	- prevent/minimise further seed production and further weed spread and establishment on site.