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# PORT OF BRISBANE CORPORATION

Final Report

## Plant Survey of Lucinda & Port Gate Drains – Port of Brisbane

July 2008

| Quality Assurance Statement | | | | |
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# EXECUTIVE SUMMARY

Natural Solutions Environmental Consultants Pty Ltd was commissioned to undertake a plant survey of Lucinda and Port Gate Drains, Port of Brisbane. This is the second report for the Port Gate Drain and the fifteenth report for Lucinda Drain.

The primary purpose of the survey and associated reporting is to monitor the occurrence and abundance of weed species listed by the Australian Quarantine and Inspection Service (AQIS). In addition to this the survey also monitors the occurrence and abundance levels of species considered to be exotic including species declared under the *Land Protection (Stock Route Management) Regulations 2003* (LPR) and locally occurring weeds. Recommendations with respect to the ongoing management of plants along Lucinda and Port Gate Drain are also provided.

## Summary of Findings

The following points summarise the findings of the March 2008 plant survey of Lucinda Drain:

- 64 plant species were recorded. This consisted of 18 native / planted species and 46 exotic species;
- Out of the 46 exotic species none were AQIS listed weed species;
- Individuals of Asparagus Fern (*Asparagus aethiopicus* cv. *sprengeri*) and Singapore Daisy (*Sphagneticola trilobata*), which are declared weeds under the LPR, were recorded during the survey. These species were last detected in October 2006;
- The same individuals of Broad-leaved Pepper Tree (*Schinus terebinthifolia*) and Lantana (*Lantana camara*), declared under the LPR, that were recorded in last survey (November 2007) were recorded again during the current survey (March 2008);
- In comparison to previous surveys, no individuals of Annual Ragweed (*Ambrosia artemisiifolia*), Prickly Pear (*Opuntia* sp.) or Creeping Lantana (*Lantana montevidensis*), Parthenium Weed (*Parthenium hysterophorus*), Chinese Celtis (*Celtis sinensis)* or Camphor Laurel (*Cinnamomum camphora*) were located during the current survey;
- A variety of locally occurring weeds and invasive natives including Red Natal Grass (*Melinis repens*), Green Panic (*Megathyrsus maximus* var. *maximus*), Blady Grass (*Imperata cylindrica*) and Rhodes Grass (*Chloris gayana*) were the dominant groups of exotic species along Lucinda Drain with periodic dominance of Glycine (*Neonotonia wightii)* occurring in certain sections of the transect; and
- Species diversity, abundance and coverage of exotic species has increased whereas native species has decreased in comparison to the last survey results (Nov 07).

The following points summarise the findings of the March 2008 plant survey of Port Gate Drain:

- 49 plant species were recorded. This consisted of 13 native / planted species and 36 exotic species;
- Out of the 36 exotic species none were AQIS listed weeds;
- Creeping Lantana (*Lantana montevidensis*) was the declared species under the LPR recorded for the first time during the survey;
- Groundsel (*Baccharis halimifolia*) and Lantana (*Lantana camara*), declared under the LPR recorded in the previous survey (November 2007), were recorded again in the current survey (March 2008);
- Locally occurring weeds, in particular Red Natal Grass (*Melinis repens*), Green Panic (*Megathyrsus maximus* var. *maximus*), and Feather-top Rhodes Grass (*Chloris virgata*) were the dominant groups of exotic species along Port Gate Drain with periodic dominance of Sesbania Pea (*Sesbania cannabina*) occurring in the southern end of the drain;
- The drain was dominated by exotic species with a very low abundance of native plants recorded. However the number of native species present along the drain has increased since the last survey, particularly native sedges and succulent plants; and
- Exotic species diversity has substantially increased but abundance and coverage has remained predominantly consistent with the previous survey results.

## Summary of Recommendations

Recommendations regarding the short and long-term management of exotic species within the Lucinda and Port Gate Drain areas are provided in this report. All maintenance activities are to continue as scheduled but are to be extended to include exotic species removal, particularly those declared under the LPR. It is noted that some of the declared species may be located along banks and the method of removal should be sensitive to bank stability (e.g. stem injection or cut and paint).

Furthermore it is recommended that a more adaptive, integrated and long term management of the exotic species along Lucinda Drain is implemented, especially the recommendation to increase the native plant cover.

# 1.0 INTRODUCTION

Natural Solutions Environmental Consultants Pty Ltd has been commissioned by Port of Brisbane Corporation (PBC) to undertake a survey of AQIS listed weed species along Lucinda and Port Gate Drains, Port of Brisbane[1] and to produce associated reporting detailing the findings from this survey. In addition species considered to be exotic/invasive including species declared under the *Land Protection (Stock Route Management) Regulations 2003* (LPR) and locally occurring weeds (from hereafter collectively referred to as exotic species) and invasive natives have been included in this survey and the report.

The plant surveys have been implemented in a response to a request from the Australian Quarantine and Inspection Service (AQIS) to increase surveillance relating to potential AQIS listed pest incursions. The surveys, represent a long-term monitoring program at the Port to survey for and identify AQIS listed weed species which may enter the country on containers or other materials shipped and unloaded at the Port of Brisbane facility.

The biannual plant survey for Lucinda Drain and Port Gate Drain is undertaken on a six monthly interval, during autumn (around February / March) and spring (around October / November) of each year. The current survey was undertaken in March 2008. This is the second report for the Port Gate Drain with the previous survey for this drain occurring in November 2007. This is the fifteenth report for Lucinda Drain with previous reports for this drain prepared from surveys undertaken in:

- February (summer) 2001;
- October – December (spring) 2001;
- February (summer) 2002;
- November (spring) 2002;
- March (autumn) 2003;
- November (spring) 2003;
- March (autumn) 2004;
- October (spring) 2004;
- April (autumn) 2005;
- November (spring) 2005;
- March (autumn) 2006;
- October (spring) 2006;
- March (autumn) 2007; and
- November (spring) 2007.

## 1.1 SITE DESCRIPTION

The plant surveys focus on the Lucinda and Port Gate Drain areas at the Port of Brisbane. Lucinda Drain is located along the eastern side of the Port of Brisbane and provides drainage for stormwater run-off from the hardstand areas adjacent to the drain (Figure 1). This drain also experiences tidal influence from the Boat Passage, where it discharges through the Lucinda Weir.

Lucinda Drain is a constructed drainage channel using concrete filled geo-textile sandwich construction some 2.5 kilometres in length. The berms of the channel consist of sand above the geo-textile sandwich.

[1] The Port of Brisbane was originally called Fisherman Islands. Fisherman Islands however no longer exists as a location and is now known officially as Port of Brisbane.

The channel currently has a regular maintenance schedule that provides for the west bank of the drain (adjacent to Lucinda Drive) to be mowed and sprayed for noxious weeds. The east bank of the drain has an irregular maintenance program with some time between maintenance events.

Port Gate Drain is located in the south-west portion of the Port of Brisbane at Port Gate. The drain also provides drainage for stormwater run-off from the hardstand areas adjacent to the drain as well as partially receiving tidal waters from the mouth of the Brisbane River (Figure 2). The drain is separated into two portions by Howard Smith Drive and tidal flow is prevented from entering the part of the drain to the south of this road.

Unlike Lucinda Drain the area either side of Port Gate Drain (especially in the northern portion of the drain) consists of either concrete, gravel or compacted earth, which allows for only sparse vegetation growth with the majority of vegetation located in the southern portion of the drain.


# Figure 1 - Site Map of Lucinda Drain

## Port of Brisbane Corporation

| Compiled | Compiled By | Project Manager | Reference | Datum | Scale @ A4 |
|---|---|---|---|---|---|
| 01-04-2008 | AC | NL | J08015_Figure1_SiteMap | GDA94 | 1:10,000 |

0 150 300
Meters

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# Figure 2 - Site Map of Port Gate Drain

## Port of Brisbane Corporation

| Compiled | Compiled By | Project Manager | Reference | Datum | Scale @ A4 |
|---|---|---|---|---|---|
| 01-04-2008 | AC | NL | J08015_Figure2_SiteMap | GDA94 | 1:6,000 |

0 100 200
Meters

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# 2.0 METHODOLOGY

The plant surveys of Lucinda and Port Gate Drains were undertaken on the 6 March 2008. The survey for Port Gate Drain consisted of two transects running the entire length of the eastern and western banks and measuring approximately 2m wide. Transects were undertaken on foot using the random meander technique to ensure the majority of the drain (including the bed, bank and top of bank areas) was surveyed. The presence and abundance of any AQIS listed weeds as well as exotic or invasive species that occurred along the transects was recorded on data sheets (Appendix E).

The survey for Lucinda Drain consisted of one transect which ran along the entire length of the drain's eastern bank and measured approximately 2m in width. Transects were undertaken on foot using the random meander technique to ensure the majority of the drain (including the bed, bank and top of bank areas) was surveyed. A second complete transect was not undertaken on the western bank of Lucinda Drain as the waters edge along this portion of the drain is difficult to access in places. Therefore an inspection of this bank was taken visually at regular intervals from the eastern bank of the drain and the random meander technique was undertaken of the areas of the western bank that are readily accessible from Lucinda Drive. The presence and abundance of any AQIS listed weeds as well as exotic or invasive species that occurred along the eastern bank transect and discovered during visual inspections of the western bank was recorded on data sheets (Appendix E).

Any plant species from both survey areas that were unable to be immediately identified on the site, were collected for further detailed analysis, and appropriately labelled. Plant identifications were carried out by experienced ecologists using available flora and botanical reference material, where necessary.

Due to the dense exotic/invasive vegetation cover present during the current survey in March 2008 along Lucinda Drain and the difficulty this presented for traversing the area, the survey methodology for Lucinda Drain was slightly altered. Instead of conducting the eastern bank transect, some diversions from the top of bank area had to occur and observations were undertaken from the lower reaches of the eastern bank (i.e. from the eastern side of the east bank).

## 2.1 AQIS TARGET WEEDS LIST

AQIS has prepared a list of weed species identified as presenting a threat to natural and agriculture systems. This list is contained in Appendix C.

# 3.0 RESULTS

## 3.1 LUCINDA DRAIN

Appendix A contains a list of plant species recorded during each survey from the March 2004 survey to date (March 2008).

The following points summarise the findings of the March 2008 plant survey of Lucinda Drain:

- 64 plant species were recorded. This consisted of 18 native / planted species and 46 exotic species;
- Out of the 46 exotic species none were AQIS listed weed species;
- Individuals of Asparagus Fern (*Asparagus aethiopicus* cv. *sprengeri*) and Singapore Daisy (*Sphagneticola trilobata*), which are declared under the LPR, were recorded during the survey. These species were last detected in October 2006;
- The same individuals of Broad-leaved Pepper Tree (*Schinus terebinthifolia*) and Lantana (*Lantana camara*), both declared under the LPR that were recorded in last survey (November 2007) were recorded again during the current survey (March 2008);
- In comparison to previous surveys, no individuals of Annual Ragweed (*Ambrosia artemisiifolia*), Prickly Pear (*Opuntia* sp.) or Creeping Lantana (*Lantana montevidensis*), Parthenium Weed (*Parthenium hysterophorus*), Chinese Celtis (*Celtis sinensis)* or Camphor Laurel (*Cinnamomum camphora*) were located during the current survey;
- A variety of exotic and invasive native grasses including Red Natal Grass (*Melinis repens*), Green Panic (*Megathyrsus maximus* var. *maximus*), Blady Grass (*Imperata cylindrica*) and Rhodes Grass (*Chloris gayana*) were the dominant groups of exotic species along Lucinda Drain with periodic dominance of Glycine (*Neonotonia wightii)* occurring in certain sections of the transect; and
- Species diversity, abundance and coverage of exotic species has increased whereas native species has decreased in comparison to the last survey results.

## 3.2 PORT GATE DRAIN

Appendix B contains a list of plant species recorded during the current and previous survey for this drain. The following points summarise the findings of the March 2008 plant survey of Port Gate Drain:

- 49 plant species were recorded. This consisted of 13 native / planted species and 36 exotic species;
- Out of the 36 exotic species none where AQIS listed weeds;
- Creeping Lantana (*Lantana montevidensis*), declared weed under the LPR, was recorded for the first time during the survey;
- Groundsel (*Baccharis halimifolia*) and Lantana (*Lantana camara*), declared under the LPR recorded in the previous survey (November 2007), were recorded again in the current survey (March 2008);
- Exotic grasses, in particular Red Natal Grass (*Melinis repens*), Green Panic (*Megathyrsus maximus* var. *maximus*), and Feather-top Rhodes Grass (*Chloris virgata*) were the dominant species along Port Gate Drain, with periodic dominance of Sesbania Pea (*Sesbania cannabina*) occurring in the southern end of the drain;
- The drain was dominated by exotic species with a very low abundance of native plants recorded. However the number of native species present along the drain has increased since the last survey (November 2007), particularly native sedges and succulent plants; and
- Exotic species diversity has substantially increased whereas exotic species abundance and coverage have only slightly increased since the last survey.

# 4.0 DISCUSSION

## 4.1 LUCINDA DRAIN

### 4.1.1 Weed Species Observed at Lucinda Drain

This fourteenth survey of plants occurring along Lucinda Drain has identified a total number of 64 plant species. Of these 46 are considered exotic.

No AQIS listed weed species were recorded during the March 2008 plant survey. However four declared species listed under the LPR were recorded within Lucinda Drain during the survey. The species, their Class under LPR and abundance / indicative location are outlined in Table 1. Appendix D provides GPS co-ordinates of the location of these declared species recorded during the previous survey (November 2007) as well as during the current survey (March 2008).

TABLE 1 THE CLASS AND ABUNDANCE OF THE DECLARED WEED SPECIES (UNDER LPR) RECORDED DURING THE LUCINDA DRAIN SURVEY

| CLASS | SPECIES | ABUNDANCE/LOCATION |
|---|---|---|
| Class 3 pests | Broad-leafed Peppertree (*Schinus terebinthifolia)* | Low to medium abundance mainly along the eastern bank. |
| | Singapore Daisy (*Sphagneticola trilobata*) | Small patch recorded at the northern end of the eastern bank |
| | Asparagus Fern *(Asparagus aethiopicus* cv. Sprengeri) | One individual recorded on the western bank within landscaped beds |
| | Lantana (*Lantana camara)* | Low abundance mainly along the eastern bank. |

A comparison between previous and current GPS co-ordinates, abundance levels and indicative locations suggests that many individual LPR Class 3 pest species identified during the November 2007 survey were again noted in the March 2008 survey. Under the LPR landholders are encouraged to remove Class 3 species. Therefore, consideration should be given to remove the declared Class 3 species, including individuals that have been planted in the past. It is noted that some of these declared species are located along the banks of the drain and there may be bank stability issues associated with their removal.

A decline in weeds classified as Class 2 under the LPR since the previous survey is evident from the current survey results and the declared species recorded in the current survey (Table 1) appear to occur in relatively low abundances. The reduction in the abundance of these declared species cannot be conclusively attributed to either changes in growing conditions, plant population dynamics or regular maintenance. Lower abundance levels may be attributed to the altered methodology, which resulted in some observations being taken from the lower reaches of the eastern bank along Lucinda Drain (see Section 2.0). Since previous surveys have found that such declared species are mainly located on the top of bank area of the eastern bank, this altered methodology may have resulted in false-absence records (i.e. a species is present, but not detected).

Mile-a-minute (*Ipomoea cairica*) and Stinking Roger (*Tagetes minuta*) are not listed under LPR but are listed as environmental / noxious weeds by Brisbane City Council (BCC) and were located during the survey.

### 4.1.2 Comparisons between Lucinda Drain Surveys

No AQIS listed species have ever been recorded during the surveys of Lucinda Drain. Therefore this finding from the current survey is consistent with the previous survey results. However, variations in exotic species abundance and diversity levels have been evident in previous survey results.

Table 2 and Figure 3 highlight the number of exotic species identified in the previous plant surveys of Lucinda Drain since the commencement of the monitoring program in February 2001.

TABLE 2 NUMBER OF EXOTIC SPECIES RECORDED PER SURVEY ALONG LUCINDA DRAIN

| SURVEY | NUMBER OF EXOTIC SPECIES RECORDED |
|---|---|
| February 01 | 37 |
| October 01 | 35 |
| February 02 | 27 |
| November 02 | 35 |
| May 03 | 27 |
| November 03 | 36 |
| March 04 | 27 |
| October 04 | 29 |
| April 05 | 33 |
| November 05 | 37 |
| March 06 | 35 |
| October 2006 | 41 |
| March 2007 | 24 |
| November 2007 | 33 |
| March 2008 | 46 |

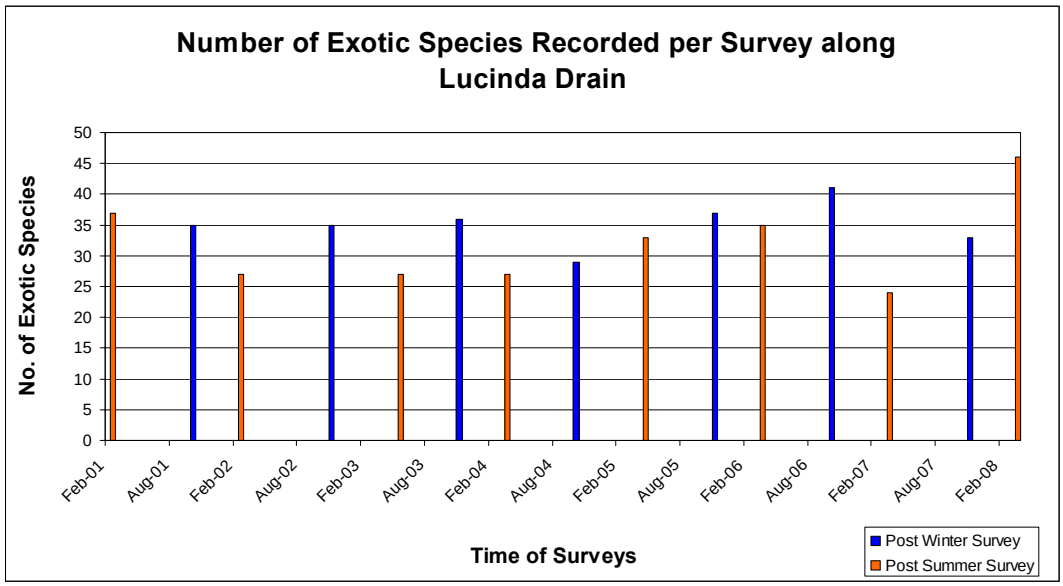


*Figure 3* *Number of Exotic Species Recorded per Survey along Lucinda Drain*

Table 3 outlines the numbers of exotic species within each family that were recorded in the previous and current surveys.

TABLE 3 NUMBER OF EXOTIC SPECIES BY FAMILY FOR LUCINDA DRAIN

| FAMILY | NUMBER OF EXOTIC SPECIES MARCH 2007 | NUMBER OF EXOTIC SPECIES NOVEMBER 2007 | NUMBER OF EXOTIC SPECIES MARCH 2008 |
|---|---|---|---|
| Asteraceae | 5 | 8 | 9 |
| Poaceae | 7 | 5 | 8 |
| Fabaceae | 4 | 5 | 6 |
| Verbenaceae | 2 | 4 | 3 |
| Amaranthaceae | 0 | 0 | 2 |
| Commelinaceae | 0 | 1 | 2 |
| Malvaceae | 1 | 2 | 2 |
| Agavaceae | 0 | 0 | 1 |
| Anacardiaceae | 1 | 1 | 1 |
| Asparagaceae | 0 | 0 | 1 |
| Brassicaceae | 0 | 0 | 1 |
| Convolvulaceae | 1 | 1 | 1 |
| Cyperaceae | 0 | 0 | 1 |
| Euphorbiaceae | 0 | 0 | 1 |
| Onagraceae | 0 | 0 | 1 |
| Oxalidaceae | 0 | 1 | 1 |
| Plantaginaceae | 0 | 1 | 1 |
| Portulacaceae | 1 | 1 | 1 |
| Primulaceae | 0 | 1 | 1 |
| Rubiaceae | 0 | 0 | 1 |
| Solanaceae | 1 | 1 | 1 |
| Asclepiadaceae | 0 | 0 | 0 |
| Boraginaceae | 0 | 0 | 0 |
| Cactaceae | 1 | 1 | 0 |
| Caesalpiniaceae | 0 | 0 | 0 |
| Lauraceae | 0 | 0 | 0 |
| Passifloraceae | 0 | 0 | 0 |
| Ulmaceae | 0 | 0 | 0 |

Shading indicates dominant family group

From the data contained within Tables 2 and 3 as well as Figure 3 the following can be deduced:

- There has been a relatively consistent trend of the number of exotic species along Lucinda Drain in the post summer and post winter surveys. Generally surveys undertaken early in the calendar year (post summer) generally provides less exotic species (i.e. species diversity) than those conducted in the later half of the calendar year (post winter). However the number of exotic species recorded in the current post summer survey (46 in March 2008) is not only the highest number of exotic species recorded since the monitoring of Lucinda Drain commenced, it is also significantly higher than the number of exotic species recorded in the previous post winter survey (33 in November 2007). The results are therefore not consistent with the previous general trend;
- Exotic species cover / extent as well as species diversity throughout the eastern side of the drain was significantly higher in the March 2008 survey compared to the previous survey (November 2007);
- Inconsistencies with general trend pattern as well as high exotic species cover / extent and diversity recorded during the current survey may be attributed to unusual weather conditions, the schedule regime of maintenance activities and the alteration in the survey methodology;
- Recent weather conditions of high rainfall combined with warm temperatures produced ideal growing conditions for exotic species in the area (see Section 4.3);
- These recent weather conditions combined with the continuation of the current set maintenance schedule resulted in the spread and increase in coverage / extent;
- The alteration in the survey methodology for the recent survey (see Section 2.0) resulted predominantly in observations being undertaken from the lower reaches of the eastern bank as compared to the general methodology where surveys for the majority are conducted from the top of bank area with only occasional random meanders along the lower reaches of the eastern bank. This in turn lead to a greater amount of survey time and a closer focus on the species currently present in this area. General observations show the top of bank to be generally dominated by exotic grasses and the eastern bank to have a more diverse community. Therefore the altered methodology allowed for a greater number of species to be recorded ; and
- Dominance in family type for the current March 2008 survey remained the same as the previous survey undertaken in November 2007 with the greatest number of exotic species originating from the Asteraceae family. The last autumn survey undertaken in March 2007 found that pioneer species such as grasses from the Poaceae family were dominate along the drain. Although this was the case along the top of bank area of the eastern bank for the current survey, the combination of weather conditions (see Section 4.3) and the altered survey methodology (see above) allowed for a greater number of species from different families to grow and also be recorded. This also resulted in records of species from families, not previously detected along the drain.

Furthermore the decrease in immature native species that were observed during the current survey is a result of exotic grass species being allowed to proliferate, out-compete and over crowd the native saplings and/or was possibly a result of their removal during maintenance activities.

## 4.2 PORT GATE DRAIN

### 4.2.1 Weed Species Observed at Port Gate Drain

The second survey of plants occurring along Port Gate Drain has identified a total number of 49 plant species. Of these 36 are considered exotic.

No AQIS listed weed species were recorded during the March 2008 plant survey. However three LPR declared species were recorded within Port Gate Drain during the survey. The species, their Class under LPR and abundance / indicative locations are outlined in Table 4. Appendix D provides GPS co-ordinates for the location of these declared species.

TABLE 4 THE CLASS AND ABUNDANCE OF THE DECLARED SPECIES (UNDER LPR) RECORDED DURING THE PORT GATE DRAIN SURVEY

| CLASS | SPECIES | ABUNDANCE/LOCATION |
|---|---|---|
| Class 2 pests | Groundsel Bush (*Baccharis halimifolia)* | Several clusters recorded along the drain |
| Class 3 pests | Lantana (*Lantana camara)* | Low abundance recorded along the southern drain |
| | Creeping Lantana (*Lantana montevidensis*) | Low abundance recorded along the southern portion of the drain |

Numerous bushes of the LPR Class 2 species, Groundsel (*Baccharis halimifolia*) recorded during the previous survey (November 2007) were again observed to be scattered throughout the survey area. The other declared species (Class 3) were recorded in relatively low abundances. Under the LPR landholders are obliged to attempt to remove Class 2 species and encouraged to remove Class 3 species. Therefore consideration should be given to remove these declared species and control further establishment.

Mile-a-minute (*Ipomoea cairica*) and Wild Aster (*Aster subulatus*) are not listed under LPR but are listed as environmental / noxious weeds by Brisbane City Council (BCC) and were recorded during the survey.

### 4.2.2 Comparisons between Port Gate Drain Surveys

No AQIS listed species have ever been recorded during a Port Gate Drain plant survey. Therefore this finding from the current survey is consistent with the previous survey results. However, an analysis of the numbers and species of exotic vegetation recorded during this survey and compared to the previous surveys indicates that there is a variation between both exotic species type and the number of exotic species recorded.

Table 5 and Figure 4 highlight the numbers of exotic species identified in the previous and current plant surveys of Port Gate Drain since the commencement of the monitoring program in November 2007.

TABLE 5 NUMBER OF EXOTIC SPECIES RECORDED PER SURVEY ALONG PORT GATE DRAIN

| SURVEY | NUMBER OF EXOTIC SPECIES RECORDED |
|---|---|
| November 07 | 29 |
| March 08 | 36 |

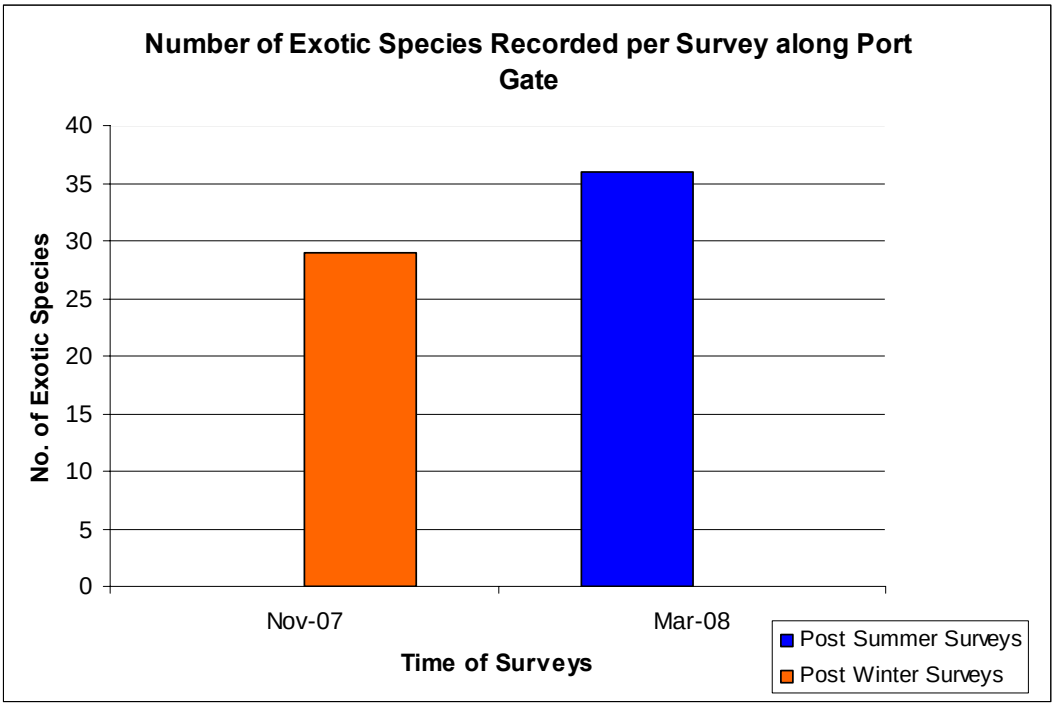


*Figure 4 Number of Exotic Species Recorded per Survey along Port Gate Drain*

Table 6 outlines the numbers of exotic species within each family that were previously and recently recorded at Port Gate Drain.

TABLE 6 NUMBER OF EXOTIC SPECIES BY FAMILY FOR PORT GATE DRAIN SURVEY

| FAMILY | NUMBER OF EXOTIC SPECIES NOVEMBER 2007 | NUMBER OF EXOTIC SPECIES MARCH 2008 |
|---|---|---|
| Poaceae | 7 | 9 |
| Fabaceae | 6 | 7 |
| Asteraceae | 5 | 5 |
| Cyperaceae | 0 | 2 |
| Euphorbiaceae | 0 | 2 |
| Verbenaceae | 1 | 2 |
| Amaranthaceae | 0 | 1 |
| Asclepiadaceae | 1 | 1 |
| Chenopodiaceae | 0 | 1 |
| Convolvulaceae | 1 | 1 |
| Myrtaceae | 1 | 1 |
| Passifloraceae | 1 | 1 |
| Phytolaccaceae | 1 | 1 |
| Portulacaceae | 1 | 1 |
| Solanaceae | 1 | 1 |
| Agavaceae | 0 | 0 |
| Anacardiaceae | 0 | 0 |
| Asparagaceae | 0 | 0 |
| Boraginaceae | 0 | 0 |
| Cactaceae | 0 | 0 |
| Caesalpiniaceae | 0 | 0 |
| Commelinaceae | 0 | 0 |
| Lauraceae | 0 | 0 |
| Malvaceae | 0 | 0 |
| Oxalidaceae | 0 | 0 |
| Papaveraceae | 1 | 0 |
| Plantaginaceae | 0 | 0 |
| Primulaceae | 1 | 0 |
| Ulaceae | 0 | 0 |

Shading indicates dominant family group

From the data contained within Tables 5 and 6 as well as Figure 4 the following can be deduced:

The number of exotic species recorded in the current Port Gate Drain post summer survey (36 in March 2008) is higher than the number of exotic species recorded in the last post winter survey (29 in November 2007);

- Similar to the current survey results for Lucinda Drain, more exotic species were recorded in the post summer survey (March 2008) than the post winter survey (November 2007). This is most likely attributed to the weather conditions (see section 4.3), which has allowed more exotic species to germinate and grow creating a higher diversity and an observed slightly higher species coverage, particularly in the southern section of the drain;
- Although the level of exotic species infestation is low at the Port Gate Drain, exotic species diversity is still quite high. This could be attributed to the low plant competition associated with low coverage of vegetation as well as the ease of detectability; and
- Dominance in family type is similar to the previous survey (November 2007), with Poaceae being the most abundant family present. This could be attributed to the overall harsh conditions that surround the drain and thus the ability of pioneer grasses to grow successfully.

## 4.3 WEATHER CONDITIONS

The following graph (Figure 5) portrays the rainfall recorded at the Port of Brisbane as well as the long term rainfall and temperature averages (taken from the Brisbane Airport).

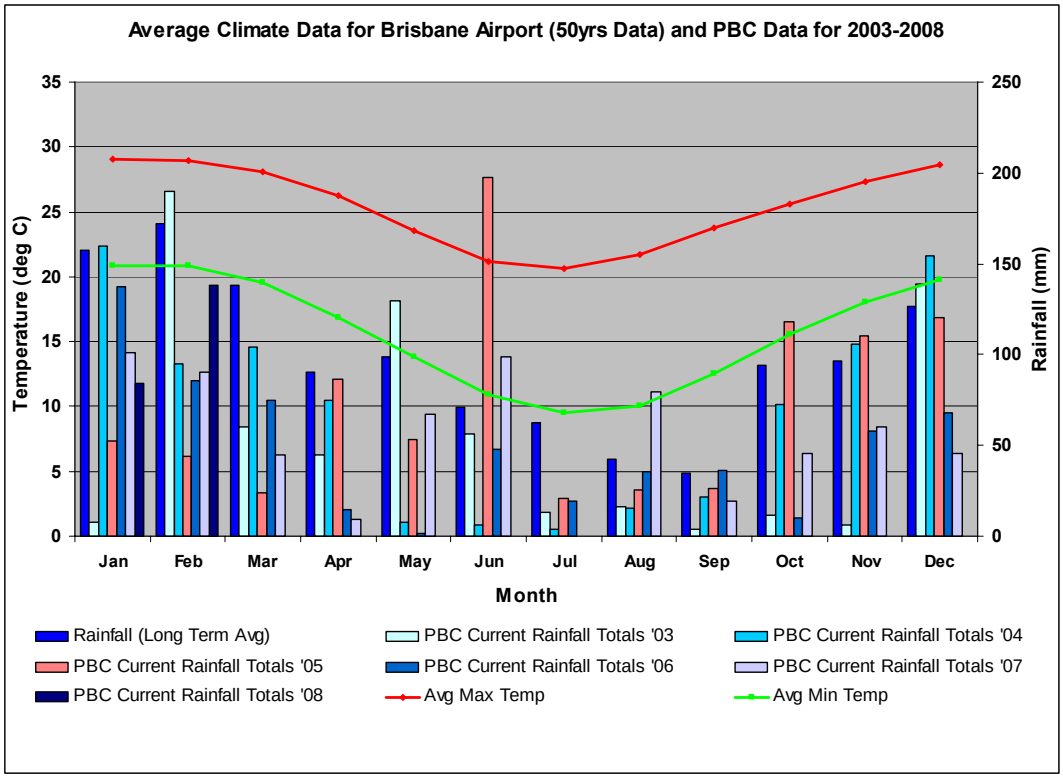


*Figure 5 Long-term Climatic Averages compared with the Port of Brisbane Rainfall Data*

The following can be derived from this data with respect to the plant growth around Lucinda and Port Gate Drains:

- During the period over which the previous 2007 plant surveys were undertaken, South East Queensland was suffering from an extended dry period. This would have assisted in reducing the number of exotic species and the coverage of exotic vegetation that were recorded along both drains in previous surveys;
- Due to the timing of the current survey occurring after a significant period of rainfall and warm summer temperatures, a greater number of exotic species would have been able to regerminate and grow extensively throughout both drains. Although rainfall totals over the November to February months are not as high as they have been in previous years (i.e. 2003, 2004 & 2005), the combination of high rainfall days intermitted by hot humid days has produced ideal growing conditions for exotic species;
- The break in Brisbane's drought conditions would have resulted in an initial peak of exotic species abundance and diversity. However, at the time of the current survey the growth of exotic species appears to have reached the extent where more successful species such as exotic grasses have out grown and out competed other exotic species. This was particularly the case for the top of bank area of Lucinda Drain whilst the lower bank still maintained high diversity levels; and
- As Port Gate Drain consists of a barer (i.e. less competitive) environment than Lucinda Drain, the additional rain would have created more suitable growing spaces for exotic species, which were filled by a variety of exotic species. This is indicated by the slightly higher diversity levels recorded during the current survey.

# 5.0 RECOMMENDATIONS

The following recommendations pertain to the presence of exotic species occurring along both Lucinda and Port Gate Drains. As no AQIS listed species have been detected recommendations addressing AQIS listed weed species have not been given.

## 5.1 LUCINDA DRAIN

Recommendations relating to the management of the banks of the Lucinda Drain and of the inflow of stormwater have been made in previous reports. In addition to these the following recommendations are made:

1. Ensure all existing maintenance programs occur along the eastern bank as well as the western bank of the Lucinda Drain. This should include regular mowing and spot spraying/hand pulling as well as other weed removal techniques along the eastern bank;
2. Ensure attempts are made to remove **all** declared species under the LPR (see **Appendix D** for GPS locations). As there may be bank stability issues associated with the removal of some of these species, it is recommended that a stem injection removal technique is employed. This method will ensure the tree (and associated root structure) remains in-situ for as long as possible, whilst simultaneously ensuring all seeding / propagule material is controlled. Also, the routine management of this area should include appropriate maintenance of these species;
3. Where exotic species appear to be assisting in maintaining bank stability other removal techniques such as stem injection or cut and paint control methods should be implemented; and
4. Continue programmed monitoring of the diversity and status of plant species along the banks of the Lucinda Drain through twice-yearly plant surveys.

In regards to the regular maintenance program that is currently implemented along Lucinda Drain it is suggested that this program is made adaptive to the prevailing climatic conditions. The results from this latest survey highlight that an alteration in normal seasonal conditions can result in a significant change in the germination, growth and propagation rate of exotic species. Although there are general trends, the environment is dynamic and the maintenance program should reflect this and be able to respond to unexpected changes. Scheduled maintenance activities may need to be brought forward if current climatic conditions produce ideal growing environments such as heavy rain and high temperatures. Time between maintenance activities should not be long enough for exotic species to flower or seed. This may involve regular “check-ups” of the area to monitor the growth rate and life cycle stage of the weeds.

The positive effects of native vegetation cover, in relation to potentially suppressing or decreasing exotic vegetation cover, have been observed along Lucinda Drain in previous surveys, especially in regards to species from the Casuarinaceae family. Such canopy species provide shading and dense matting from dropped needles produced conditions which potentially aid in decreasing the amount of understorey exotic vegetation. Thus the long-term management of exotic species present at Lucinda Drain should be incorporated into a program of integrated weed management, including actions such as:

- Exotic species suppression through mulching and shading via the planting of a native canopy and understorey;
- Planting density of native species should be responsive to still allowing access for the regular maintenance program; and

- Increasing the native understorey diversity to increase competition for resources.

## 5.2 PORT GATE DRAIN

The Port Gate Drain has different environmental conditions and disturbance regimes, which require a slightly different management approach. As some areas surrounding the drain are concreted and will remain in this disturbed and unnatural state, the establishment of native plants to shade out exotic vegetation is limited and only possible in certain locations such as the southern end of the drain. In this area it is still recommended that this long-term management approach is adopted and that these areas are successfully rehabilitated.

Therefore, for the remaining areas of this drain other strategies will play an important role for the long-term management of this area. The following recommendations for these areas include:

- Implementation of weed removal strategies such as mechanical removal through mowing. Chemical weed removal should be kept to a minimum and only used when necessary. It should only involve spot spraying using an environmentally sensitive herbicide during low flow periods;
- Ensure attempts are made to remove **all** declared species under the LPR are to be removed (see Appendix D for GPS locations);
- Where exotic species appear to be assisting in maintaining bank stability of Port Gate Drain other weed removal techniques such as stem injection or cut and paint methods should be implemented;
- Continue scheduled maintenance programs along the drain; and
- Continue to monitor of the drain's weed status at regular intervals.

# 6.0 REFERENCES

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# APPENDIX A Survey Results Of Lucinda Drain

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 | MAR 07 | OCT 06 | MAR 06 | NOV 05 | MAR 05 | OCT 04 |
|---|---|---|---|---|---|---|---|---|---|---|
| Aizoaceae | | | | | | | | | | |
| *Carpobrotus glaucescens* | Pigface* | - | X | X | X | X | X | X | X | X |
| *Sesuvium portulacastrum* | Sea Purslane* | - | X | X | X | X | X | X | X | X |
| *Tetragonia tetragonioides* | New Zealand Spinach* | - | X | X | | | | | | |
| Amaranthaceae | | | | | | | | | | |
| *Alternanthera pungens* | Khaki Weed | - | | | | | | | X | |
| *Amaranthus quitensis* | South American Amaranthus | - | | | | | | X | | |
| *Amaranthus viridis* | Green Amaranths | - | X | | | | | | X | |
| *Gomphrena celosioides* | Gomphrena Weed | - | X | | | X | X | | | |
| Anacardiaceae | | | | | | | | | | |
| *Schinus terebinthifolius* | Broad-leaved Peppertree | 3 | X | X | X | X | X | X | | X |
| Asclepiadaceae | | | | | | | | | | |
| *Gomphocarpus physocarpus* | Balloon Cotton Bush | - | | | | X | X | | | |
| Asparagaceae | | | | | | | | | | |
| *Asparagus aethiopicus* cv. Sprengeri | Asparagus Fern | 3 | X | | | X | | | | |
| Asteraceae | | | | | | | | | | |
| *Ageratum houstonianum* | Blue Billy-Goat | - | X | | | X | | X | | |
| *Ambrosia artemisiifolia* | Annual Ragweed | 2 | | X | X | X | | X | | X |
| *Ambrosia tenuifolia* | Lacy Ragweed | - | | X | | | | | | |
| *Baccharis halimifolia* | Groundsel Bush | 2 | | | | | | | | X |
| *Bidens pilosa* | Cobblers Pegs | - | X | X | X | X | X | X | X | X |
| *Calyptocarpus vialis* | Creeping Cinderella Weed | - | | | X | | | | X | |
| *Cirsium vulgare* | Spear Thistle | - | | | | X | | X | | X |
| *Conyza bonariensis* | Faxleaf Fleabane | - | X | | | | X | X | X | |
| *Conyza pusilla* | Canadian Fleabane | - | X | X | X | X | X | X | | |
| *Crassocephalum crepidioides* | Thickhead | - | | | | | | X | X | X |
| *Gamochaeta calviceps* | Cudweed | | | X | | | | | | |
| *Emilia sonchifolia* | Emilia | - | | | | X | X | | | |
| *Hypochaeris radicata* | Flatweed | - | X | X | X | X | X | | | X |
| *Parthenium hysterophorus* | Parthenium Weed | 2 | | | | | X | | | |
| *Sonchus oleraceus* | Rough Sow Thistle | - | X | X | | | | X | X | |

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 | MAR 07 | OCT 06 | MAR 06 | NOV 05 | MAR 05 | OCT 04 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sphagneticola trilobata* | Singapore Daisy | 3 | X | | | X | X | | | X |
| *Tagetes minuta* | Stinking Roger | - | X | X | | X | X | | X | |
| *Tridax procumbens* | Tridax Daisy | - | X | | | | | | | |
| Agavaceae | | | | | | | | | | |
| *Agave* sp. | Agave | - | X | | | X | | | | |
| Avicenniaceae | | | | | | | | | | |
| *Avicennia marina* | Grey Mangrove* | - | X | X | X | X | X | X | X | X |
| Boraginaceae | | | | | | | | | | |
| *Heliotropium amplexicaule* | Blue Heliotrope | - | | | | X | X | X | | |
| Brassicaceae | | | | | | | | | | |
| *Lipidium africanum* | Common Peppercress | | X | | | | | | | |
| Cactaceae | | | | | | | | | | |
| *Opuntia sp* | Prickly Pear | 2 | | X | X | | | | | |
| Casuarinaceae | | | | | | | | | | |
| *Casuarina equisetifolia* | Coastal Sheoak* | - | X | X | X | X | X | X | X | X |
| *Casuarina littoralis* | Black Sheoak* | - | X | X | X | X | X | X | X | X |
| Caesalpiniaceae | | | | | | | | | | |
| *Crotalaria paniculata* | Poor Mans Gold | - | | | | | | | | |
| *Senna pendula var glabrifolia* | Easter Cassia | - | | | | | | | | |
| Commelinaceae | | | | | | | | | | |
| *Commelina benghalensis* | - | - | X | | | | | | | |
| *Commelina diffusa (C. cyanea)* | Wandering Jew | - | X | X | | | X | | | |
| Convolvulaceae | | | | | | | | | | |
| *Cuscuta campestris* | Dodder | - | | | | X | | | X | |
| *Convolves arvensis* | European Bindweed | - | | | | | | | | |
| *Ipomoea so (alba)* | White Ipomoea | - | | | | | | X | | |
| *Ipomoea cairica* | Mile-a-Minute | - | X | X | X | X | X | X | | X |
| *Ipomoea pes-caprae* | Goats Foot Convolvus* | - | X | | | | | X | X | X |
| Cyperaceae | | | | | | | | | | |
| *Carex appressa* | Tall Sedge* | - | | | | | X | | | |
| *Cyperus congestus* | Clustered Flatsedge | - | | | | | | X | | |
| *Cyperus eragrostis* | Umbrella Sedge | - | X | | | | | X | | |
| *Cyperus rotundus* | Nut Grass | - | | | | | X | | | |
| *Cyperus polystachyos* | Bunchy Sedge | - | | | | | X | | | |
| Euphorbiaceae | | | | | | | | | | |

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 | MAR 07 | OCT 06 | MAR 06 | NOV 05 | MAR 05 | OCT 04 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Chamaesyce maculata* | Caustic Weed | - | | | | | | | X | |
| *Euphorbia hirta* | Asthma Plant | - | | | | | | | | X |
| *Euphorbia prostrata* | Caustic Creeper | - | X | | | | | X | | |
| *Euphorbia sp.* | Spurge | - | | | | | | | | |
| *Macaranga tanarius* | Macaranga* | - | X | X | X | X | X | X | X | X |
| *Phyllanthus virgatus* | Creeping Phyllantus | - | | | | | | | X | |
| Fabaceae | | | | | | | | | | |
| *Canavalia rosea** | Coastal Jack Bean* | - | X | | | | | | | |
| *Crotaria incana* | Wooly Rattle Pod | | X | | | | | | | |
| *Crotalaria pallida* | Rattle Pod | - | | X | X | X | X | X | X | |
| *Desmodium uncinatum* | Silver Leafed Desmodium | - | | | | X | | | X | |
| *Macroptilium atropurpureum* | Siratro | - | X | X | X | X | X | X | X | X |
| *Macroptilium lathyroides* | Phasey Bean | - | | | | X | | | | |
| *Medicago polymorpha* | Burr Medic | - | | X | | X | | | | |
| *Medicago sativa* | Lucerne | - | | | | | X | X | | X |
| *Melilotus albus* | Bokhara | | | X | | | | | | |
| *Melilotus indicus* | Sweet Melilotus | - | | | | X | | X | | X |
| *Neonotonia wightii* | Glycine | - | X | X | X | X | | X | | |
| *Sesbania cannabina* | Sesbania Pea | - | X | | | | X | X | X | |
| *Stylosanthes hamata* | Verano Stylo | - | X | | | | | | | |
| *Trifolium repens* | Clover | - | X | | X | X | X | | | |
| *Vigna marina** | Yellow Beach Bean* | - | | | | | X | | | |
| Lauraceae | | | | | | | | | | |
| *Cinnamomum camphora* | Camphor Laurel | 3 | | | | X | | | | X |
| Malvaceae | | | | | | | | | | |
| *Hibiscus tiliaceus* | Cotton Tree* | - | X | X | X | | X | X | X | X |
| *Modiola caroliniana* | Red Flower Mallow* | - | | | | | | | | |
| *Sida cornifolia* | Flannel Weed | - | X | X | X | | X | X | X | X |
| *Sida rhombifolia* | Common Sida | - | X | X | | | X | | X | |
| Mimosaceae | | | | | | | | | | |
| *Acacia aulacocarpa* | Hickory Wattle* | - | | | X | | X | X | | X |
| *Acacia leiocalyx* | Curracabah* | - | | X | | | | | | |
| Myrtaceae | | | | | | | | | | |
| *Eucalyptus robusta* | Swamp Mahogany* | - | | | X | X | X | X | X | |
| *Lophostemon confertus* | Brush Box* | - | X | X | X | X | X | X | X | X |

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 | MAR 07 | OCT 06 | MAR 06 | NOV 05 | MAR 05 | OCT 04 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Melaleuca linariifolia* | Flax-leafed Paperbark* | - | X | X | X | X | X | X | X | X |
| *Melaleuca quinquenervia* | Paperbark Teatree* | - | X | X | X | X | X | X | X | X |
| *Callistemon viminalis* | Weeping Bottlebrush* | - | | X | | X | | X | | |
| Onagraceae | | | | | | | | | | |
| *Oenothera drummondii* subsp. drummondii | Beach Primrose | - | X | X | X | X | X | X | X | X |
| Oxalidaceae | | | | | | | | | | |
| *Oxalis corniculata* | Creeping Oxalis | - | X | X | | | | | | |
| Pandanaceae | | | | | | | | | | |
| *Pandanus tectorius** | Screw Pine* | - | X | X | X | X | X | X | X | X |
| Passifloraceae | | | | | | | | | | |
| *Passiflora cairica* | Stinking Passion Vine | - | | | | X | | | | X |
| *Passiflora subpeltata* | White Passion Flower | - | | | | | | X | | X |
| Plantaginaceae | | | | | | | | | | |
| Plantago lanceolata | Lamb's Tongue | | X | X | | | | | | |
| Poaceae | | | | | | | | | | |
| *Brachiaria decumbens* | Signal Grass | | X | | X | | X | | X | |
| *Brachiaria mutica* | Para Grass | | X | | X | | | | X | X |
| *Cenchrus ciliaris* | Buffel Grass | - | | | | | | | | |
| *Cenchrus echinatus* | Mossman River Grass | - | X | | | X | X | X | X | X |
| *Chloris gayana* | Rhodes Grass | - | X | X | X | X | X | X | X | X |
| *Chloris truncata* | Windmill Grass | - | | X | | | X | | X | X |
| *Chloris virgata* | Feather-top Rhodes Grass | - | | | | | X | X | X | |
| *Cynodon dactylon* | Couch Grass | - | X | X | X | X | X | X | X | X |
| *Dichanthium aristatum* | Angleton Grass | - | | | | | | | | |
| *Digitaria ciliaris* | Summer Grass | | | | | | | | | |
| *Echinochloa telmatopila* | Swamp Barnyard Grass | - | X | | | | | | | |
| *Eleusine indica* | Crowsfoot Grass | - | | | | | | | X | |
| *Hemarthria uncinata* | Mat Grass | - | | | | | | | | |
| *Imperata cylindrical** | Blady Grass* | - | X | X | X | X | X | | | |
| *Melinis repens* | Red Natal Grass | - | X | X | X | X | X | X | X | X |
| *Melinis minutiflora* | Molasses Grass | | | | | X | | | | |
| *Poa annua* | Winter Grass | - | | | | | | | | |
| *Panicum effusum* | Hairy Panic | - | | | | | | X | X | |
| *Megathyrsus maximus var. maximus* | Green Panic | - | X | X | X | X | X | X | X | X |

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 | MAR 07 | OCT 06 | MAR 06 | NOV 05 | MAR 05 | OCT 04 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Paspalum dilatatum* | Paspalum | - | | | | | X | | | |
| *Phragmites australis** | Common Reed* | - | X | X | X | X | | X | X | X |
| *Sorghum halepense* | Johnson Grass | - | | | | X | X | X | X | X |
| *Typha orientalis** | Cumbungi / Typha* | - | | | | X | X | X | X | X |
| *Urochloa mosambicensis* | Sabi Grass | - | | | | | | X | | |
| Portulacaceae | | | | | | | | | | |
| *Portulaca pilosa* | Hairy Pigweed | - | X | X | X | X | | X | X | |
| Primulaceae | | | | | | | | | | |
| *Anagallis arvensis* | Scarlet Pimpernel | - | X | X | | X | | X | | |
| Proteaceae | | | | | | | | | | |
| *Banksia integrifolia** | Coastal Banksia* | - | X | X | X | X | X | X | X | X |
| Rubiaceae | | | | | | | | | | |
| *Richardia brasiliensis* | Mexican Clover | - | X | | | | | | | |
| Sapindaceae | | | | | | | | | | |
| *Cardiospermum halicacabum* | Balloon Vine | - | | | | | | | X | |
| *Cupaniopsis anacardioides** | Tuckeroo* | - | X | X | X | X | X | X | X | X |
| *Dodonaea triquetra* | Hop Bush | | | | | | | | | |
| Solanaceae | | | | | | | | | | |
| *Solanum seaforthianum* | Brazilian Nightshade | - | | | | X | | X | X | |
| *Solanum nigrum* | Blackberry Nightshade | | X | X | X | | | | | |
| Ulmaceae | | | | | | | | | | |
| Celtis sinensis | Chinese Celtis | 3 | | | X | | X | | | |
| Verbenaceae | | | | | | | | | | |
| *Lantana camara* | Lantana | 3 | X | X | X | X | X | X | X | X |
| *Lantana montevidensis* | Creeping Lantana | 3 | | X | | X | X | | | |
| *Verbena bonariensis* | Purple Top | - | X | X | X | X | | X | | |
| *Verbena aristigera* | Mayne's Pest | - | X | X | | X | | | | |
| *Vitex trifolia* var *trifolia** | Coastal Vitex* | - | | | | | | X | | |

Notes: -

- * designates indigenous species
- LPR Class – *Land Protection (pest and stock route management) Regulations* 2003, Schedule 2.

# APPENDIX B Port Gate Survey Results

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 |
|---|---|---|---|---|
| Aizoaceae | | | | |
| *Carpobrotus glaucescens** | Pigface* | - | X | X |
| *Sesuvium portulacastrum** | Sea Purslane* | - | X | X |
| Amaranthaceae | | | | |
| *Amaranthus viridis* | Green Amaranthus | - | X | |
| Apocynaceae | | | | |
| *Parsonsia straminea** | Monkey Rope Vine* | - | X | |
| Asclepiadaceae | | | | |
| *Gomphocarpus physocarpus* | Balloon Cotton Bush | - | X | X |
| Asteraceae | | | | |
| *Ambrosia artemisiifolia* | Annual Ragweed | 2 | | X |
| *Aster subulatus* | Wild Aster | - | X | |
| *Baccharis halimifolia* | Groundsel Bush | 2 | X | X |
| *Bidens pilosa* | Cobblers Pegs | - | | X |
| *Conyza bonariensis* | Flaxleaf Fleabane | - | X | |
| *Conyza pusilla* | Canadian Fleabane | - | X | X |
| *Crassocephalum crepidoides* | Thickhead | - | X | |
| *Tagetes minuta* | Stinking Roger | - | | X |
| Casuarinaceae | | | | |
| *Casuarina equisetifolia** | Coastal Sheoak* | - | X | |
| *Casuarina littoralis** | Black Sheoak* | - | X | |
| Chenopodiaceae | | | | |
| *Atriplex muelleri** | Annual Saltbush* | - | X | X |
| *Dysphania littoralis** | Red Crumbweed* | - | X | |
| *Enchylaena tomentose** | Ruby saltbush* | - | X | |
| *Sarcocrnia quinqueflora** | Bead Weed* | - | X | |
| *Suaeda autralia* | Seablite | - | X | |
| Convolvulaceae | | | | |
| *Ipomoea cairica* | Mile-a-Minute | - | X | X |
| Cyperaceae | | | | |
| *Cyperus eragrostis* | Umbrella Sedge | - | X | |
| *Cyperus involucratus* | - | - | X | |
| *Isolepis cernua** | Nodding Club Rush* | - | X | |
| Euphorbiaceae | | | | |
| *Euphorbia hirta* | Asthma Plant | - | X | |

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 |
|---|---|---|---|---|
| *Ricinus communis* | Caster Oil Plant | - | X | |
| Fabaceae | | | | |
| *Centaurium erythraea* | Common Centaury | - | | X |
| *Crotaria incana* | Wooly Rattle Pod | - | X | |
| *Crotalaria pallida* | Rattle Pod | - | | X |
| *Indigofera hirsute* | Hairy Indigo | - | X | |
| *Macroptilium atropurpureum* | Siratro | - | X | X |
| *Macroptilium lathyroides* | Phasey Bean | - | X | X |
| *Medicago polymorpha* | Burr Medic | - | X | X |
| *Medicago sativa subsp. Sativa* | Lucerne | - | X | |
| *Neonotonia wightii* | Glycine | - | | X |
| *Sesbania cannabina* | Sesbania Pea | - | X | |
| Myrtaceae | | | | |
| *Psidium guajava* | Yellow Guava | - | X | X |
| Papaveraceae | | | | |
| *Argemone ochroleuca* | Mexican Poppy | - | | X |
| Passifloraceae | | | | |
| *Passiflora foetida* | Stinking Passion Flower | - | X | X |
| Phytolaccaceae | | | | |
| *Phytolacca octandra* | Ink Weed | - | X | X |
| Plantaginaceae | | | | |
| Plantago lanceolata | Lamb's Tongue | - | | X |
| Poaceae | | | | |
| *Arundo donax* | Giant Reed | - | X | |
| *Brachiaria mutica* | Para Grass | - | X | X |
| *Cenchrus echinatus* | Mossman River Grass | - | X | |
| *Chloris gayana* | Rhodes Grass | - | X | X |
| *Chloris truncata* | Windmill Grass | - | | X |
| *Chloris virgata* | Feather-top Rhodes Grass | - | X | X |
| *Cymbopogan refractus** | Barbed Wire Grass* | - | X | |
| *Cynodon dactylon* | Couch Grass | - | X | X |
| *Melinis repens* | Red Natal Grass | - | X | X |
| *Megathyrsus maximus var. maximus* | Green Panic | - | X | X |
| *Phragmites australis** | Common Reed* | - | X | |
| *Setaria sphacelata* | Pigeon Grass | - | X | |
| *Sporobolus virginicus** | Salt Cooch* | - | X | X |
| *Typha orientalis* | Cumbungi / Typha* | - | | X |

| SPECIES | COMMON NAME | LPR CLASS | MAR 08 | NOV 07 |
|---|---|---|---|---|
| Portulacaceae | | | | |
| *Portulaca pilosa* | Hairy Pigweed | - | X | X |
| Primulaceae | | | | |
| *Anagallis arvensis* | Scarlet Pimpernel | - | | x |
| Solanaceae | | | | |
| *Solanum nigrum* | Blackberry Nightshade | - | X | x |
| Verbenaceae | | | | |
| *Lantana camara* | Lantana | 3 | X | X |
| *Lantana montevidensis* | Creeping Lantana | 3 | X | |

Notes: -

- * designates indigenous species
- LPR Class – Land Protection (pest and stock route management) Regulations 2003, Schedule 2.

# APPENDIX C AQIS Weed Target List

| FAMILY | GENUS SPECIES | AUTHOR | COMMON NAME | COMMENTS |
|---|---|---|---|---|
| Amaranthaceae | *Amaranthus dubius* | Mart. ex Thell | Chinese Spinach | Annual crops, rice, gardens, disturbed sites and secondary vegetation. |
| Asteraceae | *Austroeupatorium inulaefolium* | (H.B.K.) King and Robinson | | Tea, rubber, rosella and other plantation crops; roadsides; environmental weed in secondary forests. |
| Asteraceae | *Chromolaena odorata* | (L.) King and Robinson | Siam Weed, Christmas Bush | Pastures, oil palm, rubber, coffee, cashew, fruit, maize, forestry. Toxic to livestock. Major environmental weed: secondary forests, roadsides, disturbed sites. |
| Asteraceae | *Mikania cordata* | (Burm. f.) B.L. Robinson | | Rubber, coffee, banana, cocoa and oil palm plantations, pastures; potential environmental weed |
| Asteraceae | *Mikania micrantha* | H.B.K. | Mile-a-Minute | Cocoa, coconut, orchards, rubber, oil palm, sugarcane, vegetables, upland rice, pastures; serious environmental weed |
| Capparaceae | *Cleome rutidosperma* | DC. | Spiderflower | Crops including vegetables, bananas, maize, tobacco, watermelons, cocoa, pineapples and coconuts; weed of disturbed ground and immature plantations. |
| Cyperaceae | *Fimbristylis umbellaris* | (Lam.) Vahl | Globular Fimbristylis | Rice, pastures; swamps. |
| Cyperaceae | *Schoenoplectus juncoides* | (Roxb.) Palla | | Rice, freshwater and tidal swamps. |
| Cyperaceae | *Scirpus maritimus* | L. | | Rice, freshwater and tidal swamps. |
| Equisetaceae | *Equisetum ramosissimum* | Desf. subsp. debile (Vauch.) Hauke | Horsetail, Scouring Rush | Rice terraces and bunds, tea plantations. |
| Eriocaulaceae | *Eriocaulon truncatum* | Buch. - Ham. ex Mart | | Rice, wetlands, river banks and floodplains |
| Euphorbiaceae | *Croton hirtus* | L'Herit | | Rubber plantations; crops including mung beans, peanuts, soybeans, papaya, vegetables and tobacco. |
| Fabaceae | *Mucuna pruriens* | DC. | Velvet Bean, Cow-Itch | Weed of pastures and a wide range of dryland crops; smothering habit and ability to climb to tree tops makes a significant potential environmental weed. Irritant hairs can kill livestock if ingested and cause severe skin reaction if touched. |
| Haloragaceae | *Myriophyllum spicatum* | L. | Eurasian Watermilfoil | Serious weed of lakes, water-storages, canals and rivers. Affects |

| FAMILY | GENUS SPECIES | AUTHOR | COMMON NAME | COMMENTS |
|---|---|---|---|---|
| | | | | fish and shellfish production and recreational use of water bodies |
| Lamiaceae | *Hyptis brevipes* | Poit. | Lesser Roundweed | Plantation crops, orchards, vegetables rice; secondary forest, and disturbed sites in areas of high rainfall. |
| Limnocharitaceae | *Limnocharis flava* | (L.) Buchenau | Yellow Bur-head, Yellow Sawah Lettuce | Serious weed of rice and wetlands. Used as a green vegetable. |
| Lythraceae | *Rotala indica* | (Willd.) Koehne | Toothcup | Rice fields, river banks, ditches and moist environments |
| Melastomaceae | *Clidemia hirta* | (L.) D. Don. | Koster's Curse, Soap Bush | Cocoa, tea, coconut, oil palm and rubber plantations, cultivated areas, pastures, secondary forest and woodlands; other disturbed sites. |
| Myrtaceae | *Rhodomyrtus tomentosa* | (Ait.) Hassk. | Downy Rose Myrtle | Environmental weed; pastures, rangelands and untended areas. |
| Nyctaginaceae | *Boerhavia erecta* | L. | | Peanuts, sorghum, rice and other annual crops; weed of cultivated land, pastures and coastal environments. |
| Piperaceae | *Piper aduncum* | L. | | Weed of grazing lands and secondary forest, roadsides; environmental weed. |
| Poaceae | *Brachiaria paspaloides* | (Presl.) C.E. Hubb | Common Brachiaria, Thurston Grass | Orchards, tea, coffee, rice, lawns, roadsides, disturbed sites. |
| Poaceae | *Coix aquatica* | Roxb. | Job's Tears | Serious weed of waterways, rice |
| Poaceae | *Digitaria fuscescens* | (Presl.) Henr. | Common Crabgrass | Tobacco, vegetables, rubber, rice; pastures, disturbed sites, roadsides, coastal dunes, dry forests. |
| Poaceae | *Digitaria insularis* | (L.) Mes ex Ekman | | Pineapples; unpalatable weed of pastures, headlands, |
| Poaceae | *Echinochloa glabrescens* | Munro ex Hook. f. | A barnyard grass | Rice, maize. |
| Poaceae | *Echinochloa stagnina* | (Retz) Beauv. | | Rice; lakes, rivers, wetlands; roadsides, open places. Potential major environmental weed. |
| Poaceae | *Eriochloa polystachya* | H.B.K. | Carib Grass | Rice, riverbanks, swamps, drains and ditches; suppresses other vegetation. |
| Poaceae | *Ischaemum timorense* | Kunth. | Centipede Grass | Cloves, cocoa, rubber, coconut, oil palm, sugarcane and rice plantations; weed of roadsides, ditches, forest margins. |
| Poaceae | *Leptochloa chinensis* | (L.) Nees. | Red Sprangletop, Feathergrass | Rice, cotton, soybean, maize, sugarcane, pineapple, sweet potato, vegetables, peanuts, tea, bananas. |
| Poaceae | *Leptochloa panicea* | (Retz.) Ohwi | Sprangletop | Rice, cotton, soybeans, peas, sugarcane, maize, peanuts, pastures. |

| FAMILY | GENUS SPECIES | AUTHOR | COMMON NAME | COMMENTS |
|---|---|---|---|---|
| Poaceae | *Sacciolepis interrupta* | (Willd.) Stapf. | | Rice, irrigation channels, wetlands. Potential environmental weed. |
| Rubiaceae | *Diodia sarmentosa* | Sw. | | Coffee, tea, leucaena, stevia sp. Plantations. |
| Rubiaceae | *Paederia foetida* | L. | Lesser Malayan Stinkwort | Sugarcane, secondary forest; climbs over shrubs and trees - potential environmental weed. |
| Rubiaceae | *Spermacoce assurgens* | Ruiz & Pav. | | Rice, maize, coconuts, sugarcane, bananas, pasture, gardens, forest clearings |
| Rubiaceae | *Spermacoce mauritiana* | Gideon | | Invades tracks in primary rainforest; rice, sugarcane, gardens, lawns. |
| Salviniaceae | *Salvinia cucullata* | Roxb. | Salvinia | Rice, waterways, wetlands. |
| Salviniaceae | *Salvinia natans* | (L.) All. | Salvinia | Rice, waterways wetlands. |
| Scrophulariaceae | *Striga angustifolia* | (D. Don.) C.J. Saldanha | Witchweed | Root parasite on rice, sorghum, sugarcane. |
| Scrophulariaceae | *Striga asiatica* | (L.) O. Ktze. | Witchweed | Serious root parasite on rice, maize, sorghum, sugarcane, millet; also on some broadleaf crops including sunflower, tomatoes, some legumes. |
| Violaceae | *Hybanthus attenuatus* | (Humb. & Bonpl.) G.K. Schulze | | Rice, a wide diversity of annual crops, pastures, waste places. |

Source: http://www.affa.gov.au

# APPENDIX D Location of Declared Species

The following table lists the GPS location of the declared species listed in Schedule 2 of the *Land Protection (Pest and Stock Route Management) Regulations 2003* that were recorded during the previous and current survey for Lucinda and Port Gate Drains. GPS readings recorded during the previous survey that are similar to the current survey reading are in bold.

## Lucinda Drain

| CLASS | SPECIES | GPS LOCATION (LATITUDE AND LONGITUDE) NOVEMBER 2007 | GPS LOCATION (LATITUDE AND LONGITUDE) MARCH 2008 |
|---|---|---|---|
| Class 1 pests | ▪ No species recorded | - | - |
| Class 2 pests | ▪ No species recorded | - | - |
| Class 3 pests | ▪ Broad-leafed Peppertree - *Schinus terebinthifolia* | 27.3922200, 153.1705700<br>27.3920800, 153.1714400<br>27.3917800, 153.1717700<br>27.3911200, 153.1728700<br>27.3909700, 153.1731600<br>27.3833100, 153.1777600<br>27.3801200, 153.1804200<br>27.3921300, 153.1709500 | No points taken |
| | ▪ Lantana – *Lantana camara* | 27.3920500, 153.1712600<br>27.382700, 153.1781500<br>27.3818500, 153.1787600<br>27.3833100, 153.1777600 | 27.3921, 153.171<br>27.3827, 153.1782 |
| | ▪ Singapore Daisy – *Sphagneticola trilobata* | - | 27.3811, 153.1794 |

Port Gate Drain

| CLASS | SPECIES | GPS LOCATION (LATITUDE AND LONGITUDE) NOVEMBER 2007 | GPS LOCATION (LATITUDE AND LONGITUDE) MARCH 2008 |
|---|---|---|---|
| Class 1 pests | ▪ No species recorded | - | - |
| Class 2 pests | ▪ Groundsel Bush – Baccharis halimifolia | - | 27.4099, 153.1623<br>27.4086, 153.1616 |
| Class 3 pests | ▪ Lantana – *Lantana camara* | 27.4089700, 153.1617100 | 27.409, 153.1617 |

# APPENDIX E Plant Survey Data Sheet

| FAMILY / SPECIES | COMMON NAME | FORM | DECLARATION CATEGORY (LPA) | PRESENCE | ABUNDANCE |
|---|---|---|---|---|---|
| Aizoaceae | | | | | |
| *Carpobrotus glaucescens* [n] | Pigface | v | - | | |
| *Sesuvium portulacastrum* [n] | Sea Purslane | h | - | | |
| Amaranthaceae | | | | | |
| *Alternanthera pungens* | Khaki Weed | h,w | - | | |
| *Amaranthus quitensis* | South American Amaranthus | h.w | - | | |
| *Amaranthus viridis* | Green Amaranthus | h,w | - | | |
| *Gomphrena celosoides* | Gomphrena Weed | h,w | - | | |
| Anacardiaceae | | | | | |
| *Schinus terebinthifolia* | Broad-leaved Peppertree | s,w | 3 | | |
| Asclepiadaceae | | | | | |
| *Gomphocarpus physocarpus* | Balloon Cotton Bush | s,w | - | | |
| Asparagaceae | | | | | |
| *Asparagus aethiopicus* cv. Sprengeri | Asparagus Fern | v,w | 3 | | |
| Asteraceae | | | | | |
| *Ageratum houstonianum* | Blue Billy-Goat | h,w | - | | |
| *Ambrosia artemisiifolia* | Annual Ragweed | h,w | 2 | | |
| *Baccharis halimifolia* | Groundsel Bush | s,w | 2 | | |
| *Bidens pilosa* | Cobblers Pegs | h,w | - | | |
| *Calyptocarpus vialis* | Creeping Cinderella Weed | h,w | - | | |
| *Cirsium vulgare* | Spear Thistle | h,w | - | | |
| *Conyza bonariensis* | Flaxleaf Fleabane | h,w | - | | |
| *Conyza pusilla* | Canadian Fleabane | h,w | - | | |
| *Crassocephalum crepidioides* | Thickhead | h,w | - | | |
| *Emilia sonchifolia* | Emilia | h,w | - | | |
| *Hypochaeris radicata* | Flatweed | h.w | - | | |
| *Parthenium hysterophorus* | Parthenium Weed | h,w | 2 | | |
| *Senecio sp (lautus)* | Fireweed | h | - | | |
| *Sonchus oleraceus* | Rough Sow Thistle | h,w | - | | |
| *Sphagneticola trilobata* | Singapore Daisy | h,w | 3 | | |
| *Tagetes minuta* | Stinking Roger | h,w | - | | |
| Agavaceae | | | | | |
| *Agave* sp. | Agave | w,p | - | | |

| FAMILY / SPECIES | COMMON NAME | FORM | DECLARATION CATEGORY (LPA) | PRESENCE | ABUNDANCE |
|---|---|---|---|---|---|
| Avicenniaceae | | | | | |
| *Avicennia marina* [n] | Grey Mangrove | t | - | | |
| Boraginaceae | | | | | |
| *Heliotropium amplexicaule* | Blue Heliotrope | h,w | - | | |
| Cactaceae | | | | | |
| *Opuntia sp.* | Prickly Pear | s,w | 2 | | |
| Casuarinaceae | | | | | |
| *Casuarina equisetifolia** | Coastal Sheoak | t | - | | |
| *Allocasuarina littoralis** | Black Sheoak | t | - | | |
| Caesalpiniaceae | | | | | |
| *Crotalaria paniculata* | Poor Mans Gold | h | - | | |
| *Senna pendula* var *glabrifolia* | Easter Cassia | s,w | - | | |
| Convolvulaceae | | | | | |
| *Cuscuta campestris* | Dodder | v,w | - | | |
| *Convolvulus arvensis* | European Bindweed | h,w | - | | |
| *Ipomoea sp. (alba)* | | v,w | - | | |
| *Ipomoea cairica* | Mile-a-Minute | v,w | - | | |
| *Ipomoea pes-caprae* [n] | Goats Foot Convolvus | v | - | | |
| Cyperaceae | | | | | |
| *Cyperus congestus* | Clustered Flatsedge | a,w | - | | |
| *Cyperus eragrostis* | Umbrella Sedge | a,w | - | | |
| Euphorbiaceae | | | | | |
| *Chamaesyce maculata* | Caustic Weed | h,w | - | | |
| *Euphorbia hirta* | Asthma Plant | h,w | - | | |
| *Euphorbia prostrata* | Caustic Creeper | h,w | | | |
| *Euphorbia sp.* | Spurge | h,w | - | | |
| *Macaranga tanarius* [n] | Macaranga | t (p) | - | | |
| *Phyllanthus virgatus* | Creeping Phyllanthus | h,w | - | | |
| Fabaceae | | | | | |
| *Crotalaria pallida* | Rattle Pod | h,w | - | | |
| *Desmodium uncinatum* | Silver-leafed Desmodium | v,w | - | | |
| *Macroptilium atropurpureum* | Siratro | v,w | - | | |
| *Macroptilium lathyroides* | Phasey Bean | v,w | - | | |
| *Medicago polymorpha* | Burr Medic | h,w | | | |
| *Medicago sativa* | Lucerne | h,w | - | | |

| FAMILY / SPECIES | COMMON NAME | FORM | DECLARATION CATEGORY (LPA) | PRESENCE | ABUNDANCE |
|---|---|---|---|---|---|
| *Melilotus indicus* | Sweet Melilotus | h,w | - | | |
| *Neonotonia wightii* | Glycine | v,w | - | | |
| *Sesbania cannabina* | Sesbania Pea | h,w | - | | |
| *Trifolium repens* | White Clover | h,w | - | | |
| Lauraceae | | | | | |
| *Cinnamomum camphora* | Camphor Laurel | t,w | 3 | | |
| Malvaceae | | | | | |
| *Hibiscus tiliaceus* [n] | Cotton Tree | t | - | | |
| *Modiola caroliniana* [n] | Red Flower Mallow | h,w | - | | |
| *Sida cornifolia* | Flannel Weed | h,w | - | | |
| *Sida rhombifolia* | Common Sida | h,w | - | | |
| Mimosaceae | | | | | |
| *Acacia aulacocarpa* [n] | Hickory Wattle | t | - | | |
| Myrtaceae | | | | | |
| *Eucalyptus robusta* [n] | Swamp Mahogany | T,(p) | - | | |
| *Lophostemon confertus* [n] | Brush Box | T,(p) | - | | |
| *Melaleuca linariifolia* [n] | Flax-leafed Paperbark | t,(p) | - | | |
| *Melaleuca quinquenervia* [n] | Paperbark Teatree | T,(p) | - | | |
| Onagraceae | | | | | |
| *Oenothera drummondii* [n] | Beach Evening Primrose | s | - | | |
| Oxalidaceae | | | | | |
| *Oxalis corniculata* | Creeping Oxalis | h,w | - | | |
| Pandanaceae | | | | | |
| *Pandanus tectorius* [n] | Screw Pine | t,(p) | - | | |
| Passifloraceae | | | | | |
| *Passiflora cairica* | Stinking Passion Vine | v,w | - | | |
| *Passiflora subpeltata* | White Passion Vine | v,w | - | | |
| Plantaginaceae | | | | | |
| *Plantago lanceolata* | Lamb's Tongue | h,w | - | | |
| *Plantago major* | Great Plantain | h,w | - | | |
| Poaceae | | | | | |
| *Brachiaria decumbens* | Signal Grass | g,w | - | | |
| *Brachiaria mutica* | Para Grass | g,w | - | | |
| *Cenchrus ciliaris* | Buffel Grass | g,w | - | | |

| FAMILY / SPECIES | COMMON NAME | FORM | DECLARATION CATEGORY (LPA) | PRESENCE | ABUNDANCE |
|---|---|---|---|---|---|
| *Cenchrus echinatus* | Mossman River Grass | g,w | - | | |
| *Chloris gayana* | Rhodes Grass | g,w | - | | |
| *Chloris truncata* | Windmill Grass | g,w | - | | |
| *Chloris virgata* | Feather-top Rhodes Grass | g,w | - | | |
| *Cynodon dactylon* | Couch Grass | g,w | - | | |
| *Dichanthium aristatum* | Angleton Grass | h,w | - | | |
| *Digitaria ciliaris* | Summer Grass | g,w | - | | |
| *Eleusine indica* | Crowsfoot Grass | g,w | - | | |
| *Hemarthria uncinata* | Mat Grass | g,w | - | | |
| *Imperata cylindrica* [n] | Blady Grass | g | - | | |
| *Melinis repens* | Red Natal Grass | g,w | - | | |
| *Melinis minutifolia* | Molasses Grass | g,w | - | | |
| *Poa annua* | Winter Grass | g,w | - | | |
| *Panicum effusum* | Hairy Panic | g | - | | |
| *Megathyrsus maximus var. maximus* | Green Panic | g,w | - | | |
| *Paspalum dilatatum* | Paspalum | g,w | - | | |
| *Phragmites australis* [n] | Common reed | g | - | | |
| *Sorghum halepense* [n] | Johnson grass | g,w | - | | |
| *Typha orientalis* [n] | Typha | g | - | | |
| *Urochloa mosambicenis* | Sabi Grass | g,w | - | | |
| Portulacaceae | | | | | |
| *Portulaca pilosa* | Hairy pigweed | h,w | - | | |
| Primulaceae | | | | | |
| Angallis arvensis | Scarlet Pimpernel | h,w | - | | |
| Proteaceae | | | | | |
| *Banksia integrifolia* [n] | Coastal Banksia | t (p) | - | | |
| Sapindaceae | | | | | |
| *Cardiospermum halicacabum* | Balloon Vine | v,w | - | | |
| *Cupaniopsis anacardioides* [n] | Tuckeroo | T | - | | |
| *Dodonaea triquetra* | Hop Bush | s | - | | |
| Solanaceae | | | | | |
| *Solanum nigrum* | Brazilian Nightshade | s,w | - | | |
| Verbenaceae | | | | | |
| *Lantana camara* | Lantana | s,w | 3 | | |
| *Lantana montevidensis* | Creeping Lantana | w | 3 | | |

| FAMILY / SPECIES | COMMON NAME | FORM | DECLARATION CATEGORY (LPA) | PRESENCE | ABUNDANCE |
|---|---|---|---|---|---|
| *Verbena bonariensis* | Purple Top | h,w | - | | |
| *Verbena aristigera* | | h,w | - | | |
| *Vitex trifolia* var *trifolia* [n] | | s | - | | |

[n] = native