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<b>Meeting</b>	Coopers Gap Wind Farm at Cooranga North – Community Consultative Committee
<b>Meeting no</b>	26
<b>Venue</b>	Cooranga North Memorial Hall, Cooranga North
<b>Time</b>	1:00pm
<b>Date</b>	1 March 2017
<b>Chair</b>	Rob Hart
<b>Attendees</b>	<p><u>Committee Members</u>: Mick Cosgrove, Cyril Stewart, Bill Sparkes, Tom Hoare</p> <p>Rob Hart (Independent Chair), Amanda Maurice (Consultant – minutes), Findlay and Alice Sharp, Will Tarry, Neville Tarry, John Meaher, Judy Pickering, Val Stewart, WH Gooderham, Celeste Nelson (JBCG), Katrina McLaughlin, Michelle Davis, Gordon Glode, Trish Christie, Ros Heit (SBRC), Sharyn Garrett (WDRC), Rob Fitzherbert (TAFE QLD)</p> <p><u>AGL</u>: Tim Knill (Construction Manager), Ray King (Site Representative), Han Tay, Anita Langborne, Sue Hogan</p> <p><u>GE-CATCON</u>: Sonny McFetridge (Project Director), Andrew O’Conner, (Onsite Manager)</p> <p><u>AECOM</u>: Michael Yeo</p>
<b>Apologies</b>	Clare Wilkes-Mildren (Government and Community AGL), Neil French

## Meeting Minutes

### 1 Welcome

Rob Hart, Independent Chair

- Rob opened the meeting at 1.10pm and welcomed Committee members, guests and community to the meeting.
- Apologies were noted.
- No conflicts of interest were raised.

### Minutes previous meeting

*Mick Cosgrove moved: That the minutes from the meeting 23 November 2017 were a true and accurate record. Tom Hoare seconded.*

*Carried*



#### Action Items

- Weed management: Weed Protocol not yet distributed, to be circulated with the minutes.

Action: Circulate Weed Protocol with the minutes.

- Communication: Contact details of Andrew O'Conner and Ray King have been circulated to landholders.
- Turbine location: proximity of turbines to residences have been checked, all non-participating sensory receptors comply with the 1.5km set back. It can be viewed on the public document map.
- Noise modelling: the same public document map confirms that 1.5km setback requirements have been achieved for all houses. Noise impacts are being re-assessed for final turbine locations and will comply with QLD Wind Farm Code requirements.

Action: Send setback map to Jim Scutt and circulate to landholders.

- Telecommunications: Clare has enquired about the possibility of landlines being cut off. This action will stay open while Clare follows up.

Action: (kept open) Clare to circulate information on the possibility of landlines being cut off

## 2 Project Update

Tim Knill, AGL Coopers Gap Construction Manager  
(refer to presentation attached)

Site has been mobilized, Powerlink has started construction of substation and foundations will be poured soon.

Roads update: roads have been used for construction works. Improvement works haven't been able to be started yet but will commence soon.

Final scope for local roads needs to be agreed with local Council. GE-CATCON is working hard to get this completed. GE-CATCON will be responsible for road works. Local contractors will be used as much as possible.

Sonny McFetridge added that typical work is road widening, intersection improvement and pavement improvements.

Action: Roads update to be added as a standing agenda item.

Action: Mobile phone reception update to be added as a standing agenda item

Telstra has been asked for a feasibility study. GE-CATCON are also looking at alternatives that include different technologies with private companies.



Sonny is pursuing Telstra and starting to get traction, Telstra have been to site. It is still in feasibility stage, so it will take some time. Telstra has suggested a 4-6 month time frame for design and construct.

**Q: Wal Gooderham asked about a Telstra repeater station as a solution?**

A: Sonny responded that GE-CATCON have dedicated people looking into all options.

### 3 Construction Update

Sonny McFetridge, GE-CATCON Project Director

Andrew O'Conner, GE-CATCON Onsite Manager

GE-CATCON has the benefits of GE's scope as a global organization combined with the windfarm experience of CATCON who is a mid-tier constructor.

**Safety:** there's been no incidents, issues or injuries to date. A few observations / reports with regard to speeding from neighbors have been received as well as some internally. GE-CATCON are looking in to these and encourage this feedback for the safety culture.

**Civil & electrical design:** construction of areas 1 and 2 is imminent. Electrical design is progressing well.

**Permitting:** there is a lot of permitting required and is tracking well. GE-CATCON are waiting on feedback from some of the relevant departments before getting the tick to proceed.

**Met mast installations:** Meteorological masts measure the 360-degree data of wind conditions providing essential information for the project. There have been 4 met masts on site for 10 years gathering data.

All new permanent met masts are now installed. Temporary met masts are nearing completion. Some will come down within 6 months and some within 2 years.

**Civil works:** the road is built for access to the sub-station as part of enabling works construction. Flora, fauna, cultural heritage surveys are currently being done and permits for clearing submitted.

**Electrical works:** cable trenching due to commence shortly.

**Transport planning:** a company located in Toowoomba has been engaged. Two routes are currently being assessed. Local contractors will be utilized for the works.

Andrew added that everything will go through Dalby and down Jandowae Road then there are 2 viable options to site. They will need to do work at all intersections for either route.

Procurement of turbine components: Blades and tower sections are currently being shipped to Australia. The first components (towers) should arrive into Port of Brisbane end of March. Components will arrive in various stages of manufacture from overseas (Asia and Europe). Not a lot of opportunity for manufacture of components in Australia.



Local engagement: local engagement of contractors and employees has been successful to date. Will continue to look for opportunities to engage locally.

CATCON will self-perform some civil works but there will be many packages of work e.g. Road work that will be available for local contractors.

**Q: Local companies have asked questions asked about the Geotech work performed by non-local companies. What happened there?**

A: A Macquarie based company did the initial geotech work. There's a balance to ensure that the local opportunities are maximized without over committing local capacity. This work had to be done immediately after financial close. There was no time to undertake a tender process.

**Q: Rob Fitzherbert asked if there could be one job board for all related roles to be advertised on?**

A: Sonny replied that they are happy to talk about doing that. GE-CATCON is using the ICN portal. There is also an email address on the AGL website for employment enquiries.

**Q: Celeste asked if the applicant information is being forwarded on to subcontractors?**

A: Andrew replied yes it will be. We haven't put subcontractors on yet.

**Q: Who will track the actual numbers of locals employed?**

A: Sonny advised they track the main ones, however, it may not go all the way down through the procurement chain. Tim added that AGL are engaging independent consultants to compile job statistics and local spend.

Mick Cosgrove commented that it's great to know we have biggest wind farm in the Southern Hemisphere. However, it has a significant impact on local community, each turbine has 500 ton of concrete in its base using enormous amounts of water which is a concern to the local community as it's a scarce commodity.

**Q: What is the water strategy?**

A: Andrew replied that the primary source of water is in the middle of the windfarm at the Iron Pot turn off. This will supply the bulk, if not all the water.

There are two other options for water supply, landowners have the choice to sell water to the project if they have an allocated license from DNRM. Tim added that once they are through the construction phase there is very little usage of water for operations unlike other energy supply alternatives such as coal fired generation.

**Q: Wal Gooderham asked if the civil aviation has been notified after observing a helicopter flying very near to a met mast?**

A: Yes, Air Services Australia need to know where the met masts and turbines are going up and when. They notify aviators by way of a 'notam', and then put them on aviation hazard maps.

Sonny advised that Luke Taylor, former Project Manager for GECATCON who attended the last meeting, has left the company for another opportunity. They are currently recruiting his replacement.



#### 4 Community Update

Ray King, AGL Site Representative

Some unwelcome news is that Greg Taffe had a heart attack and has been in hospital since Saturday. Greg has also stood down from being a CCC Committee Member. We look forward to seeing him back on his feet soon.

A company has been engaged to check TV reception and is currently visiting properties. Andrew added that it is a requirement to check TV reception before and after wind farm construction to see if there is any interference and carry out repairs if required. Not every property is being checked, they are just seeking baseline data.

Wal Gooderham responded that every house is different, so they should be checking every house rather than getting an average which won't be representative of all reception.

Action: Review the TV reception report for accuracy when its complete.

The solar connections for landholders have been slowed down due to Greg Taffe being temporarily unavailable, hopefully most outstanding systems will be connected by end of March.

**Q: Have those landowners who are delayed been notified?**

A: Ray responded that they haven't been notified yet but will be this week.

There has been only one home so far that can't be fed back in to the grid due to network capacity issues.

#### 5 Community Fund Update

Tim Knill, AGL Coopers Gap Construction Manager

The Sod Turning Ceremony held on 7th February, was a success and was attended by Energy Minister Dr. Anthony Lynham. A video of the occasion was shown.

Sue Hogan, AGL Project Co-Ordinator

A lot of feedback was taken from the first round, as a result the process and forms have been simplified.

The second round opens today and is open for the month of March. Guidelines and applications can be down loaded via the Coopers Gap website or collected from Bell Bunya Community Centre, Jandowae Library Civic Centre or Kumbia State School. Completed applications can also be dropped off at these locations.

Applicants will be notified of the result in mid-April with the announcement of winners in May. Please email or phone Sue with any questions.

Sue has been working on videos and photos of the project, please have a look on the AGL website at [agl.com.au/coopersgap](http://agl.com.au/coopersgap) and provide feedback.



Sue thanked the CWA ladies for helping setup and cater these meetings.

If you aren't on the distribution list for the Project newsletter, please let Sue know so you can be added.

**Q: Mick asked if the fund have CPI applied to it?**

A: Tim replied that yes it does, after each 12 month period.

## 6 General Business and Q&A

**Q: Can the community assist with Telstra by lobbying state or federal members?**

A: Sonny replied not at this stage. Tim added that Clare is lobbying at State government level and with others who are influential at a high level.

**Q: Will landowners Council rates rise due to the wind farm construction?**

A: Tim responded that Council is looking to charge additional rates to landowners with turbines on their properties. Clare is talking to Council. It seems they are within their legislative rights to do it if they decide to. One avenue is to lobby for the additional funds to be spent in the same area where it is sourced (in windfarm region). AGL is seeking to talk to both councils for assurances that the rate can not escalate in real terms once implemented.

**Q: Which Council shire does this relate to?**

A: Tim responded that South Burnett was the first to propose it and it is likely that Western Downs will follow a precedent.

Rob Hart added by way of Clare's update, that it is within Council's mandate to be able to do it however she is lobbying against it.

Tim added that they think it shouldn't commence until the wind farm is fully operational.

Ros Heit added that South Burnett Council is working with a consultant with the intention to be consistent with other wind farm areas in Australia.

**Q: What support will AGL provide to landholders regarding the possible rates increase**

A: Tim responded that he can't discuss it in this forum as it forms part of confidential agreements with landholders.

## 7 Next meeting and close

- Tentative date & time: in 3 months' time, 1pm 31st May 2018

Close at 2.40pm



Item:	Discussion:	
1	<b>Weed Management</b> <u>Action:</u> Circulate Weed Protocol with the minutes.	Sue
2	<b>Turbine location</b> <u>Action:</u> Send map to Jim Scutt and circulate to landholders.	Tim
3	<b>Communication</b> Action: (kept open) Clare to circulate information on the possibility of landlines being cut off.	Clare
4	<b>Roads</b> <u>Action:</u> Roads update to be added as a standing agenda item.	Sue
5	<b>TV Reception data</b> <u>Action:</u> Review the TV reception report for accuracy when it is complete.	Tim
6	<b>Telecommunications</b> <u>Action:</u> Mobile phone reception update to be added as a standing agenda item.	Sue



# Weed and Pest Management Plan

Document B1-1-22

COOPERS GAP WIND FARM

JANUARY 2018





## Document Verification



Project Title:

Coopers Gap Wind Farm

Project Number: 17-281

Project File Name: Coopers Gap Wind Farm WPMP

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Draft v1.0	23/11/17	Jane Mills Scott McGrath		
Draft v1.1	24/11/17	Jane Mills Scott McGrath	Zeina Jokadar	Jane Mills
Final v1.0	28/11/17	Zeina Jokadar	Jane Mills	Jane Mills
Final v1.1	29/11/17		Jane Mills (minor changes only)	Jane Mills
Final v1.2	25/01/18	Jane Mills		Jane Mills (minor changes)

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# 1 INTRODUCTION

## 1.1 CONTEXT

This Weed and Pest Management Plan (WPMP) forms part of the Construction Environmental Management Plan (CEMP) for the construction of the Coopers Gap Wind Farm and associated facilities (the Project). This WPMP has been prepared to address the requirements of:

- Mitigation measures listed in the Coopers Gap Wind Farm Environmental Impact Statement (EIS).
- The Assessment Manager Conditions (item 12a) (refer CEMP Table 1.1).
- The Coordinator General Conditions (refer CEMP Table 1.2).
- The Department of Infrastructure, Local Government and Planning (DILGP) Wind Farm State Code Planning Guideline (refer CEMP Table 1.3).
- Proponents commitments – Appendix 5 of the Coordinator General’s evaluation report on the environmental impact statement.
- All applicable legislation, including the *Biosecurity Act 2014*, during construction of the Project.

A separate WPMP to manage the construction of the substation bench and associated works has been prepared for the Project. This WPMP is consistent with the early stage WPMP.

## 1.2 BACKGROUND

PARF Company 10 Pty Limited (the Proponent), a company associated with AGL Energy Limited (AGL), received planning approval to develop Coopers Gap Wind Farm. The wind farm will have an installed capacity of up to 460 megawatts (MW) and a maximum of 123 wind turbines. Coopers Gap Wind Farm will connect to the Western Downs to Halys 275kV transmission line, recently completed by Powerlink.

The wind farm is located approximately 180km north-west of Brisbane, between Dalby and Kingaroy, near Cooranga North. It falls within the jurisdiction of the South Burnett Regional Council and the Western Downs Regional Council Local Government Areas (LGAs).

This WPMP has been prepared to provide guidance on how to manage the environmental risks associated with the construction of the wind farm and its associated facilities. The Project, as referred herein this document, includes the following activities:

- Site construction offices and laydown areas
- Construction of 123 wind turbines and footings
- Approximately 85km of new and upgraded access tracks, plus hardstands and laydown areas
- Approximately 93km of cable trenches
- Two concrete batch plants
- Permanent and temporary wind monitoring masts
- Approximately 9km of new 33kV overhead transmission line

Chapter 12 of the EIS assessed the impacts of construction in terms of flora and fauna, which included the impacts of weeds and pests. The EIS proposed mitigation and management measures to minimise these impacts.

### **1.3 ENVIRONMENTAL MANAGEMENT SYSTEMS OVERVIEW**

The overall Environmental Management System (EMS) for the Project is described in the CEMP. The WPMP is part of the environmental management framework for the Project. Relevant mitigation and management measures identified in this WPMP will be incorporated into the environmental element of the site or activity specific Safe Work Method Statements (SWMS).

Used together, the CEMP, WPMP, other supporting Plans and the SWMS form management guidelines that clearly identify required environmental management actions for reference by CATCON personnel and contractors.

The review and document control processes for this Plan are described in the CEMP.

## **2 PURPOSE AND OBJECTIVES**

### **2.1 PURPOSE**

The purpose of this Plan is to describe how CATCON proposes to manage potential weed and pest impacts during construction of the Project.

### **2.2 OBJECTIVES**

The key objective of the WPMP is to ensure that impacts to the existing environment from weeds and pests are minimised. To achieve this objective, the following will be undertaken:

- Ensure appropriate controls and procedures are implemented during construction activities.
- Identifying potential weeds and pests and ensure appropriate environmental controls and procedures are implemented during construction activities to minimise the risk of spread.
- Ensure appropriate measures are implemented to address the mitigation measures detailed in the EIS and approval conditions.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3 of this Plan.

### **2.3 TARGETS**

The following targets have been established for the management of weed and pest impacts during construction:

- Full compliance with the relevant legislative requirements.
- Full compliance with the relevant requirements of the EIS and approval conditions.
- No spread of pest animal or weed species beyond those areas already infested.
- No introduction of pest animal or weed species to previously non-infested areas.

### 3 ENVIRONMENTAL REQUIREMENTS

The *Biosecurity Act 2014* provides comprehensive biosecurity measures to safeguard Queensland’s economy, agricultural and tourism industries, environment and way of life, from pests, diseases and contaminants.

Relevant provisions of the *Biosecurity Act 2014* are explained in the register of legal and other requirements included in Appendix A of the CEMP.

### 4 EXISTING ENVIRONMENT

#### 4.1 WEEDS

The following weed species were identified in the EIS as occurring in the wind farm area:

Pest	Biosecurity Act 2014
Opuntia spp. ( <i>Opuntia tomentosa</i> and <i>O. stricta</i> )	Restricted invasive (category 3)
Lantana ( <i>Lantana camara</i> )	Restricted invasive (category 3)
Singapore daisy ( <i>Sphagneticola trilobata</i> )	Restricted invasive (category 3)

Other weed species that were identified at the site include:

- Buffel Grass (*Cenchrus ciliare*).
- Couch (*Cynodon dactylon*).
- Green Panic (*Megathyrsus maximus*).

While these species are not classified restricted or prohibited invasive plants, they still pose a significant risk to biodiversity through altering the structure and composition of native vegetation communities.

Weed invasion is one of the dominant threats to the Semi-Evergreen Vine Thickets (SEVT) Threatened Ecological Community (TEC).

## 4.2 PESTS

The following pests were identified in the EIS as occurring in the wind farm area:

Pest	Biosecurity Act 2014
Feral Dog ( <i>Canis familiaris</i> )	Restricted invasive (category 3,4 and 6)
Feral Cat ( <i>Felis catus</i> )	Restricted invasive (category 3,4 and 6)
European Rabbit ( <i>Oryctolagus cuniculus</i> )	Restricted invasive (category 3,4,5 and 6)
European Fox ( <i>Vulpes vulpes</i> )	Restricted invasive (category 3,4,5 and 6)

Other pest species that were identified at the site include:

- Cane Toad (*Bufo marinus*)
- Domestic Cow (*Bos taurus*)
- Brown Hare (*Lepus capensis*)
- House Mouse (*Mus musculus*)
- Black Rat (*Rattus rattus*)

# 5 ENVIRONMENTAL ASPECTS AND IMPACTS

## 5.1 ENVIRONMENTAL ASPECTS

The Project will involve a range of activities incorporating various heavy machinery, plant and equipment. To assess the risk of weed and invasive species introduction and spread, the construction activities likely to interact with these receivers were identified. For this project, the activities include earthworks and vegetation clearing for:

- Construction of the access roads (approximately 85km).
- Clearing and profiling works for the wind turbine hardstand areas and turbine footings.
- Installation of electric cabling (those works which are not located within the new access roads)
- Construction of temporary access roads to facilitate construction of overhead transmission lines
- Construction of temporary hardstand areas for concrete batch plant
- Construction of temporary hardstand areas for construction amenities
- Construction erosion and sediment control devices including sedimentation ponds
- Installation of underground cabling and construction of concrete footings for the wind monitoring masts.

In addition, there is the risk for weeds or pests to be imported with the turbine components or any other materials that are sourced from overseas. This risk is reduced by the standard inspection and quarantine requirements of the Australian Quarantine Inspection Service.

## **5.2 IMPACTS**

The potential for weeds and pests impacts on the existing environment will depend on a number of factors. Typically, these might include:

- Existing presence of weed and pest species.
- Construction methodology.
- Vehicle hygiene.
- Time of year.

Potential impacts of construction of the Project include:

- Introduction of pest animal or weed species to previously non-infested areas.
- Spread of pest animal or weed species from infested areas.

Mitigation and management measures listed in Section 6 of this Plan will be implemented to avoid or minimise these impacts on the existing environment.

## **6 ENVIRONMENTAL CONTROL MEASURES**

Environmental requirements and control measures are identified in the various environmental documents, including the EIS. Specific measures and requirements to address impacts from weeds and pests are outlined in Table 6-1 below.

**Table 6-1 Weed and pest management and mitigation measures.**

Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
<ul style="list-style-type: none"> <li>All personnel entering the construction site or associated areas must be instructed on:               <ul style="list-style-type: none"> <li>their responsibilities for restricted and prohibited weed management</li> <li>cleaning procedures for vehicles and equipment</li> <li>weed identification and weed reporting</li> <li>hygiene procedures appropriate to pests and diseases.</li> </ul> </li> </ul>	Induction package. Toolbox training material.	Pre-construction, construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>Washdown facilities to be installed at main site entry/exit point to enable soil and weeds from machinery to be removed, if the need is identified following a site assessment.</li> <li>Where possible, wash down areas should be located close to infected/infested areas of restricted weed species to reduce the risk of spreading.</li> <li>On proceeding out of an area infested with restricted weed species, all equipment and vehicles must be thoroughly washed down and air-cleaned, if possible, in accordance with Queensland Government, local shire and landowner requirements.</li> </ul>	Weed certification inspections for vehicles and equipment. Induction package. Toolbox training material. Daily work plans. Washdown area.	Pre-construction, construction	CATCON	EIS commitment Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>Prior to commencement of construction works, CATCON must conduct a site inspection to identify restricted and prohibited weed species within the construction area and undertake the following:               <ul style="list-style-type: none"> <li>take GPS coordinates and photographs of any weed or other pest / disease infestation</li> <li>ensure appropriate treatment measures are initiated before any earth moving machinery or vehicles enter the area</li> <li>ensure no vehicles proceed to the area until the infested area has been pegged</li> <li>report to the relevant authority, if necessary (relevant only to Category 2 restricted invasive plants and prohibited invasive plants which are not currently known to be onsite).</li> </ul> </li> </ul>	Site inspection/weed survey. Induction package. Toolbox training material.	Pre-construction, construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>During construction, CATCON must control all restricted and prohibited weed species within the construction area. If treatment is undertaken, photos will be taken prior to and after treatment applications to provide a visual assessment of the effectiveness of methods to reduce weed density.</li> </ul>	Weed management strategy. Weed surveys.	Pre-construction, construction	CATCON	Assessment manager conditions 12(a)



Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
<ul style="list-style-type: none"> <li>All vehicles, machinery, plant and equipment and demountables must be inspected on arrival at site (by the HSE Advisor) and declared clean before being allowed access to the Project site.</li> <li>If vehicles/equipment do not pass the weed inspection, they must be cleaned prior to accessing the site.</li> </ul>	Weed certification inspections for vehicles and equipment. Induction package. Toolbox training material. Daily work plans. Washdown area.	Construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>Weed species may be disposed by:               <ul style="list-style-type: none"> <li>Burying the matter in the ground at a depth that ensures any seeds or vegetative material being disposed cannot grow; or</li> <li>Transporting the matter directly to a waste facility if the matter is                   <ul style="list-style-type: none"> <li>In a sealed container or covered vehicle; or</li> <li>Covered in a way that prevents the restricted matter from being lost or released during transport; or</li> <li>Sealing the matter in plastic and leaving in the sun until any vegetative material has decomposed.</li> </ul> </li> </ul> </li> </ul>	Induction package. Toolbox training material.	Construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>All personnel undertaking chemical weed control measures must be trained and qualified to store and handle chemicals.</li> </ul>	Induction package. Toolbox training material. Daily work plans.	Construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>For any substantial outbreak of a restricted or prohibited weed species detected in the approved construction area or access tracks, the area must be isolated with no access permitted until the area is declared to be controlled for weeds.</li> </ul>	Restricted access to infested areas. Weed surveys.	Construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>Gravel, mulch, sand and soil must be certified weed and pest free before accepted at site. CATCON must retain copies of weed hygiene declaration forms for these bulk materials.</li> </ul>	Material inspections.	Construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>Weekly visual inspection of construction areas will be undertaken for new infestations of weeds or pests and to determine efficacy of measures in weed treatment areas.</li> <li>CATCON must ensure that new weed infestations, feral animal sightings and any suspected plant or animal diseases are documented, photographed and the GPS location recorded.</li> </ul>	Weed and pest surveys.	Construction	CATCON	EIS Section 12.0 Assessment manager conditions 12(a)

Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
<ul style="list-style-type: none"> <li>If mosquitos at the site become a nuisance, a mosquito management plan will be implemented to reduce the potential for transmitting disease. The plan will include the following components: <ul style="list-style-type: none"> <li>Investigate any complaints/reports of mosquito activity.</li> <li>Monitor areas of standing water (sediment ponds) and, if required, undertake measures to reduce the potential for these areas to act as a mosquito breeding habitat.</li> <li>Engage an expert to identify existing and emergent breeding sites to determine appropriate response and treatment.</li> <li>When planning mosquito control treatments, give consideration to minimising environmental harm.</li> <li>If chemical control is required, application of the pesticide must be in accordance with the products specifications and manufacturer's recommendations.</li> </ul> </li> </ul>	Toolbox training material.	Construction	CATCON	Proponent commitment 85
<ul style="list-style-type: none"> <li>A Pest Management Technician, licensed under the <i>Pest Management Act 2001</i>, will be engaged when pest control activities are required to be undertaken during construction.</li> </ul>	Induction package.	Construction	CATCON	Proponent commitment 86
<ul style="list-style-type: none"> <li>Manage putrescible waste to avoid attracting pests.</li> </ul>	Induction package.	Construction	CATCON	Assessment manager conditions 12(a)
<ul style="list-style-type: none"> <li>In order to protect the vegetation in riparian areas, and therefore prevent and limit damage to riparian habitats, manually remove weed species within and adjacent to construction areas and adjacent to wind farm infrastructure.</li> </ul>	Induction package. Toolbox training material.	Construction	CATCON	Proponent commitment 247

## **7 COMPLIANCE MANAGEMENT**

### **7.1 ROLES AND RESPONSIBILITIES**

The Project Team's organisational structure and overall roles and environmental responsibilities are outlined in the CEMP.

### **7.2 TRAINING**

All employees, contractors and utility staff working on site will undergo site induction training relating to weed and pest management and this WPMP, including:

- Existence and requirements of this sub-plan.
- Requirements under relevant legislation and Project Conditions.
- Specific responsibilities to minimise impacts of weeds and pests on the existing environment.
- Responsibilities for restricted weed and pest management, cleaning procedures for vehicles and equipment, plus identification and reporting of weeds and pests.

### **7.3 INSPECTIONS AND MONITORING**

Weekly visual inspection of construction areas will be undertaken for new infestations of weeds or pests and to determine efficacy of measures in weed treatment areas.

Details of inspections and monitoring are outlined in the CEMP.

### **7.4 NON-CONFORMANCES**

Non-conformances in general will be dealt with and documented in accordance with the CEMP.

### **7.5 AUDITING**

Audits (both internal and external) will be undertaken to assess the effectiveness of, and compliance with this Plan and other relevant guidelines. Audit requirements are detailed in the CEMP.

### **7.6 REPORTING**

Reporting requirements and responsibilities are documented in the CEMP.

## **8 REVIEW AND IMPROVEMENT**

### **8.1 CONTINUOUS IMPROVEMENT**

Continuous improvement of this Plan will be achieved by the ongoing evaluation of Weed and Pest Management performance against objectives and targets, to identify opportunities for improvement, as further detailed in the CEMP.

### **8.2 UPDATE AND AMENDMENT**

This WPMP will need to be updated or amended whenever:

- The construction program, scope of work, or work methods change.
- The work methods of mitigation measures are found to be ineffective.
- If directed by the Proponent.

This will occur as needed and in accordance with the process described in the CEMP.

## APPENDIX A RESTRICTED INVASIVE SPECIES

### 1. *Opuntia* spp. factsheet

Velvety tree pear (*O. tomentosa*)

Common prickly pear (*O. stricta*)

<https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/prohibited/prickly-pear>

### 2. Lantana fact sheet

<https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/lantana>

### 3. Singapore Daisy fact sheet

<https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/singapore-daisy>

# Opuntioid cacti

*Austrocyllindropuntia*, *Cylindropuntia* and *Opuntia* species



Three types (genera) of opuntioid cacti have naturalised in Australia and are now considered Weeds of National Significance: *Austrocyllindropuntia*, *Cylindropuntia* and *Opuntia*. They are drought resistant because of their succulent nature, their lack of leaves and their thick, tough skins. These features result in plants that use the majority of their internal tissues for water storage and their outer parts to reduce water loss and damage by grazing and browsing animals. They can remain vigorous in hot, dry conditions that cause most other plants to lose vigour or even die. Some species develop underground bulbs that enable the plant to resist fire and mechanical damage.

Dense infestations compete with native vegetation, limiting the growth of small shrubs and groundcover species. The plant's sharp spines or barbs can cause injury to stock and native animals and contaminate wool and hides, reducing or preventing grazing activities and productivity.

Large stands of cacti provide harbour for pest animals, such as foxes and rabbits and, due to their spiny nature, can limit access for stock mustering and recreational activities. The spines are capable of causing serious injury to animals and humans.



## Legal requirements

All Cholla cacti (*Cylindropuntia* spp.) and prickly pear (*Opuntia* spp.) not listed below are prohibited invasive plants and the *Biosecurity Act 2014* requires that all sightings to be reported to Biosecurity Queensland within 24 hours. By law, everyone has a general biosecurity obligation (GBO) to take all reasonable and practical steps to minimise the risk of these cacti spreading until they receive advice from an authorised officer.

The following species are restricted invasive plants under the Act. The Act requires that all sightings of these cacti must be reported to Biosecurity Queensland within 24 hours of the sighting. By law, everyone has a GBO to take all reasonable and practical steps to minimise the risk of spread of these cacti until they receive advice from an authorised officer.

- Hudson pear (*Cylindropuntia rosea* and *C. trunicata*)
- Jumping cholla (*Cylindropuntia prolifera*)
- Bunny ears (*Opuntia microdasys*)
- Riverina pear (*Opuntia elata*)

The following species are restricted invasive plants under the *Biosecurity Act 2014*. They must not be given away, sold, or released into the environment without a permit. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

- Cane cactus (*Austrocyllindropuntia cylindrical*)
- Eve's pin cactus (*Austrocyllindropuntia subulata*)
- Coral cactus (*Cylindropuntia fulgida*)
- Devil's rope pear (*Cylindropuntia imbricata*)
- Snake cactus (*Cylindropuntia spinosior*)
- Common pest pear, spiny pest pear (*Opuntia stricta* Syn. *O. inermis*)
- Drooping tree pear (*Opuntia monacantha* Syn. *O. vulgaris*)
- Tiger pear (*Opuntia aurantiaca*)
- Velvety tree pear (*Opuntia tomentosa*)
- Westwood pear (*Opuntia streptacantha*)

Indian fig (*Opunia ficus-indica*) is not prohibited or restricted invasive plant.

At a local level, each local government must have a biosecurity plan that covers invasive plants and animals in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

## Description

Opuntoid cacti vary significantly in their form and habit, ranging from low-growing shrubs under 50 cm to erect trees up to 8 m tall.

Plants are normally leafless succulent shrubs. Stems are divided into segments (pads or joints) that are flat and often incorrectly called leaves.

Young shoots have true leaves resembling small fleshy scales that fall off as the shoot matures.

Flowers are large, normally seen during spring and can be yellow, orange, red, pink, purple or white depending on the species. Fruits vary between species and can be red, purple, orange, yellow or green.

Areoles (spots with clusters of spines) are found on both the pads (joints, segments) and fruit. In addition to spines, areoles often have clusters of sharp bristles (glochids) and tufts of fibre ('wool'). Each areole contains a growing point that can produce roots or shoots.

### Hudson pear (*Cylindropuntia rosea* and *C. tunicata*)

Densely branched cactus up to 1.5 m tall and 3 m wide. Spines are extremely sharp, 4.5 cm long, enclosed in whitish papery sheaths. Spines on *C. rosea* are white and *C. tunicata* are brown. Flowers on *C. rosea* are pink-purple, and on *C. tunicata* they are pink-yellow, 5 cm wide. Stem segments are green to grey-green, cylindrical, 90 cm long, 4 cm wide. Fruit is oval-shaped, up to 4.5 cm long, yellow when ripe.

### Jumping cholla (*Cylindropuntia prolifera*)

Low shrub 0.4 to 1 m tall. Spines 7–11, 1–2 cm long, light to dark brown, interlacing, white to light tan sheath firmly attached. Flowers are rose to magenta, 25–30 mm wide. Stem segments are dull green to greenish grey, whorled or subwhorled, cylindrical, 4–15 cm long, 4–5 cm wide, waxy flaky surface when dry. Prominent tubercles and segments easily detached. Fruit obovoid to globose, solitary or forming chains, up to 20–50 mm long, green. Seed not seen in Australia.

### Bunny ears (*Opuntia microdasys*)

Dense shrub 40–60 cm tall, occasionally more. Stems are pad-like, 6–15 cm long, 4–12 cm wide. No central stem, pads always grow in pairs, giving appearance of bunny ears. Has no spines, but instead has numerous white or yellow glochids (hair-like prickles), 2–3 mm long, in dense clusters. Flowers are yellow, 3 cm wide. Fruits are fleshy, globular, 3 cm long, red-purple.

### Riverina pear (*Opuntia elata*)

Branched shrub with erect branches to 2 m tall. Spines absent or 1–3 short spines, whitish yellow present at some areoles. Flowers are orange, 3–4 cm wide. Stem segments are glossy green, sometimes with a purple tinge (especially around the areoles and margins). Often more than 2 cm thick, 5–25 cm long. Fruit club shaped, up to 6 cm long, purplish red.

### **Cane cactus** (*Austrocyllindropuntia cylindrica*)

Dark green shrub, 0.5–1.5 m tall. Branches 35–40 mm diameter. Leaves on new growth, deciduous, 3–5 mm long, but up to 10 mm on regrowth. Spines without papery sheath, 3–6 major ones per areole, 9–25 mm long, and 3–4 minor ones, to 5.5 mm long. Flowers are red to red-orange. Fruit solitary or in small chains of 2–4. 30–60 mm long, dark green to yellow-green.

### **Eve's pin cactus** (*Austrocyllindropuntia subulata*)

Robust shrub to 3 m tall. Branches 40–50 mm diameter. Spines without papery sheath, 1 per areole on new growth, additional smaller ones (up to five) developing in successive years, mostly 35–70 mm long. Flowers are pink. Stem segments are glossy green, sometimes with a purple tinge (especially around the areoles and margins). Often more than 2 cm thick, 5–25 cm long. Fruit large, solitary or in small chains of 2–4, green, 50–135 mm long.

### **Coral cactus** (*Cylindropuntia fulgida*)

Coral cactus grows as a branching shrub 1–1.5 m high. The stems of coral cactus are divided into green cylinder-like pads that are fist-like and obtuse at their apex. Mature coral cactus pads widen, become distorted and wavy, and resemble a piece of coral. Areoles along the pads have a number of short white spines.

Coral cactus produces small (1–2 mm wide) scarlet flowers. The fruit is yellow-green and 2–5 cm wide.

### **Devil's rope pear** (*Cylindropuntia imbricata*)

This open-branching shrub grows 1.5–3 m high. The stems are divided into hairless, dull green, cylindrical pads that vary up to 37 cm in length and are 3.5–5 cm thick. The pads have a series of short raised ridges that give them a twined, rope-like appearance. The areoles are found on these ridges and produce 3–11 pale yellow or white spines, with the longest being 2.5 cm long. Papery sheaths cover these spines.

The flowers are a dull, red-purple colour and found at the ends of pads. The yellow fruit resembles a small, 5 cm wide custard apple and has a spineless areole at the top.

### **Snake cactus** (*Cylindropuntia spinosior*)

This open-branching shrub grows 1–2 m high. The stems are divided into hairless, dull green, cylindrical pads that vary up to 20 cm in length and are 3.5–5 cm thick. The pads have a series of short raised ridges that give them a twined rope-like appearance. The areoles are found on the bottom of these ridges and produce 5–10 pale yellow to brown spines, with the longest being 3 cm long.

The flowers are light red to dark rose and commonly 5–7 cm wide. Snake cactus produces fruit that is yellow and 2–5 cm wide.

### **Common pest pear, Spiny pest pear** (*Opuntia stricta*)

This bushy, spreading plant grows up to 1.5 m high and forms large clumps. The stems are divided into oval, blue-green spineless pads 20 cm long and 10 cm wide. Areoles are in diagonal lines along the pads 2.5 cm to 5 cm apart and have a cushion of brown wool containing bristles but usually no spines. When spines occur they are stout, yellow and up to 4 cm long.

Flowers that are 7.5 cm wide, bright lemon yellow and green at the base. The fruit is oval-shaped, has a deep cavity on one end and tapers at the other. It is purple, 6 cm long and 3 cm wide, with carmine-coloured (dark red) seeds and a fleshy pulp.

### **Drooping tree pear** (*Opuntia monacanta*)

This erect succulent shrub with fibrous roots grows up to 5 m high but is usually 2–3 m high. The branches are divided into glossy light green pads up to 45 cm long, 15 cm wide and 1.5 cm thick. The dark grey trunk grows up to 25 cm in diameter. Drooping tree pear gets its name because the upper segments tend to droop. The areoles on the older pads have 1–5 sharp spines about 5 cm long.

Small, scale-like leaves are found on areoles of very young pads and are quickly shed as the pad grows. Drooping tree pear produces yellow flowers that are 6 cm wide and have red markings on the back. The fruit is pear-shaped and 4–7 cm long with a green skin. The flesh of the fruit is red and pulpy and contains round seeds that are yellow or pale brown. The fruits have areoles with tufts of fine, barbed bristles.

### **Tiger pear** (*Opuntia aurantiaca*)

This succulent low shrub with underground tubers usually grows 30–60 cm high. The stems are divided into very spiny, slightly flattened pads that are 1–30 cm long and 1–5 cm wide. The stems are dark green to purple and red in colour. The areoles have 3–7 brown barbed spines up to 4 cm long surrounded by tufts of short, fine bristles. The pads detach easily and are transported on the skins of animals. Small and scale-like leaves are found on areoles of immature pads.

Tiger pear produces 6 cm wide yellow flowers. The rarely formed fruits are pear-shaped and about 2.5 cm long. When ripe, they are red with purple markings.

### **Velvety tree pear** (*Opuntia tomentosa*)

This tree-like plant forms a central woody trunk over 40 cm wide and grows up to 5 m high. The stems are divided into oblong pads that are dull green and velvety to touch due to the dense covering of short fine hairs. The pads are 15–35 cm long, 8–12 cm wide and 1.5–2 cm thick.

Young plants have 2–4 white or pale yellow spines located in the areoles with one spine reaching a length of 2.5 cm. The areoles usually become spineless as the plant matures. A more spiny variety does exist and has more than 50 spines in each areole on the trunk.

The flowers are a deep orange. The fruit is egg-shaped, about 5 cm long and 3 cm wide, and dull red. The top of the fruit is saucer-shaped with circular lines that meet in the centre and give the fruit a shrivelled appearance. The fruit produces many seeds within a reddish pulp.

### **Westwood pear or Cardona pear** (*Opuntia streptacantha*)

Westwood pear is a shrub-like or tree-like plant that forms clumps by branching from the base and is usually 2–4 m high. The stems are divided into almost circular dull green pads, 25–30 cm long and 15–20 cm wide. The areoles have white spines that vary in number and size when the plant matures.



Young pads have 2–5 white spines 1–2 cm long, accompanied by two hair-like spines 0.5 cm long in the lower part of the areole. Spines increase in number (up to 20) and size (5 cm long) in areoles along the trunk of the plant.

The flowers are yellow and fruits are barrel-shaped, 6 cm long and 5 cm wide with a flat top. The fruit has a purple skin and a rind that is 1 cm thick. Fruits contain red seeds buried in a dark red (carmine) pulp.

## Habitat and distribution

Native to the Americas, Opuntoid species are found throughout most Australian states and territories and there is potential for further spread.

In Queensland Opuntoid species are mainly found in low rainfall areas but can be found in gardens, along beaches and on off shore island.

## Life cycle

Opuntoids reproduce both sexually and asexually. Birds and other animals readily eat the many seeded fruits and deposit seeds in their droppings. The seeds have hard seed coats that allow them to survive heat and lack of water. Asexual reproduction (cloning) of cacti occurs when pads (joints, segments) or fruits located on the ground take root and produce shoots.

## Methods of spread

Animals and floods move broken pads long distances. These pads can survive long periods of drought before weather conditions allow them to set roots. People can spread cacti for ornamental plantings.

## Control

### Managing opuntoid cacti

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by opuntoid cacti. This fact sheet provides information and some options for controlling opuntoid cacti.

### Mechanical and fire control

Mechanical control using machinery is difficult because prickly pear pads can easily re-establish. A hot fire is an effective control method for dense prickly pear infestations. Before burning, consult Biosecurity Queensland to see if this practice is suitable for your pasture and land management practices.

### Biological control

Investigations into biological control agents against prickly pear began in 1912. Over 150 insect species were studied throughout the world, with 52 species selected for transport to Queensland. Following intensive host specificity testing, 18 insects and one mite were released in Queensland. Nine insects and the mite remain established in Queensland. These species are:

*Cactoblastis cactorum*, a stem-boring moth

- *Dactylopius ceylonicus*, a cochineal mealy bug
- *Dactylopius opuntiae*, a cochineal mealy bug
- *Dactylopius confusus*, a cochineal mealy bug
- *Dactylopius tomentosus*, a cochineal mealy bug
- *Dactylopius austrinus*, a cochineal mealy bug
- *Chelinidea tabulata*, a cell-sucking bug
- *Tucumania tapiacola*, a stem-boring moth
- *Archlagocheirus funestus*, a stem-boring beetle
- *Tetranychus opuntiae*, prickly pear red spider mite.

These biological control agents continue to keep several prickly pear species under control. It is important to remember not all the agents attack all species.

The most successful of these agents were the moth *Cactoblastis cactorum* and five cochineal mealy bugs—*Dactylopius ceylonicus*, *D. opuntiae*, *D. confusus*, *D. tomentosus* and *D. austrinus*. The other agents are still around but not in sufficient numbers to provide control.

### *Cactoblastis cactorum* (cactoblastis moth)

Larvae of this moth were introduced from Argentina in 1925. *Cactoblastis* proved to be the most effective agent against the common and spiny pest pears, destroying massive infestations in Australia. Larvae keeps these two pest pears controlled to an acceptable level most of the time, although it is less effective in some coastal and far western areas.

The larvae collectively eat out the contents of the pads, leaving empty pad skins and piles of mushy droppings. The orange and black larvae are occasionally observed on the outsides of pads. *Cactoblastis* also attacks most types of prickly pear but is not effective against them.

### *Dactylopius* spp. (cochineal insects)

All female cochineal insects are small, sessile mealy bugs that spend their adult lives permanently attached to their host plants sucking plant juices. They are covered by a fine, white, waxy secretion and when crushed yield a carmine colouring. The adult males are small, free-flying insects that do not feed.

### *Dactylopius ceylonicus* (monacantha cochineal, Argentine cochineal)

This South American mealy bug was released in 1914 and 1915 to control drooping tree pear. It destroyed the dense infestations existing at that time. It is specific to drooping tree pear and today remains the only effective biological control agent for drooping tree pear. This insect needs to be distributed manually.

### *Dactylopius opuntiae* (prickly pear cochineal)

This mealy bug was introduced from Mexico and southern United States between 1920 and 1922. It is effective against common pest pear, spiny pest pear, velvety tree pear and Westwood pear and remains the main biological control agent against velvety tree pear and Westwood pear. This insect spreads slowly in nature and can be assisted manually.

### ***Dactylopius confusus* (prickly pear cochineal)**

This mealy bug was introduced from Florida and released in 1933 against spiny pest pear. It remains effective against spiny pest pear in central Queensland but spreads slowly. This insect can be spread manually.

### ***Dactylopius tomentosus* (devil's rope pear cochineal)**

This mealy bug was introduced from southern United States in 1925 and 1926. It is effective against devil's rope pear but works slowly.

### ***Dactylopius austrinus* (tiger pear cochineal)**

This mealy bug was introduced from Argentina in 1932. It is specific to and effective against tiger pear. It rapidly reduces tiger pear populations but dies out in a paddock after the destruction of tiger pear. It needs to be reintroduced after tiger pear regrows.

### ***Chelinidea tabulata* (prickly pear bug)**

This plant-sucking bug was introduced from Texas in 1921. It was effective against dense common pest pear before *Cactoblastis cactorum* was but is now relatively ineffective. This insect also attacks most other prickly pears. The adult is a pale brown bug up to 20 mm long that leaves characteristic round bleached spots on the surface of the cactus.

### ***Tucumania tapiacola* (prickly pear moth-borer)**

This moth was introduced from Argentina in 1934 against tiger pear. Its solitary larvae feed internally and eat out tiger pear pads with limited effect. It has been observed attacking common pest pear and harrisia cactus.

### ***Archlagocheirus funestus* (tree pear beetle)**

This stem-boring beetle was introduced from Mexico in 1935. It was effective against velvety tree pear and Westwood pear but has become rare since the dense stands of these prickly pears have gone.

### ***Tetranychus opuntiae* (prickly pear spider mite)**

This mite was introduced from southern United States and Mexico in 1922. It was effective against common pest pear but is now rare and difficult to find. It causes distinctive scar tissue formation around areoles.

## **Distributing biological control agents**

### **Cactoblastis**

Cactoblastis can be spread manually by distributing eggs or larvae. Cactoblastis moths lay chains of eggs (eggsticks) on prickly pear pads from January to February and from September to November. The eggsticks are distinguished from spines by their curved appearance.

1. Collect the fragile eggsticks carefully.
2. Glue single eggsticks to small pieces of paper using a starch-based adhesive.
3. Pin the egg papers to prickly pear pads. (Eggs take up to one month to hatch.)
4. Collect pads or plants in which larvae are obviously still active.

5. At a release site place all the collected plant material in a small part of the infestation.
6. Subsequent generations of moths will disperse through the infestation.
7. Follow up the biological control with either herbicide or mechanical treatment.

### **Cochineals**

Because several cochineal insects affect some prickly pears and not others, it is essential to know what prickly pear you wish to control.

1. Identify your prickly pear type.
2. Find the same prickly pear type which is being attacked by a cochineal.
3. Collect pads of the prickly pear with the insects.
4. Place affected pads against unaffected prickly pears at the release site.
5. Follow up the biological control with either herbicide or mechanical treatment.

### **Tiger pear cochineal**

Tiger pear cochineal is easy to multiply quickly after collection.

1. Carefully collect a reasonable quantity of unaffected tiger pear in a container (box or bucket).
2. Place a few pieces of cochineal-affected tiger pear into the same container.
3. Cover the container with a cloth and store under cover for a few weeks.
4. Check the cactus occasionally.
5. When most of the tiger pear in the container has cochineal, it is ready to distribute.
6. At the release site place affected pads against unaffected prickly pears.
7. Follow up the biological control with either herbicide or mechanical treatment.

Note: It is best to multiply tiger pear cochineal before release.

### **Herbicide control**

Herbicide options available for the control of opuntioid cacti in Queensland are shown in Table 1.

Landholders and contractors should check if the property is in a hazardous area as defined in the *Agricultural Chemicals Distribution Control Act 1966* prior to spraying.

## **Further information**

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).

**Table 1. Herbicides for the control of opuntoid cacti**

Pest name	Situation	Herbicide	Rate	Method
Common prickly pear	Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Basal bark/cut stump Apply as an overall spray, wetting all areas of plant to ground level
	Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L + picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8g/L (Grazon Extra)	500 mL/100 L	Apply as a thorough foliage spray
		Triclopyr 600 g/L (e.g. Garlon 600)	3 L/100 L or 0.8 L/60 L diesel	
Coral cactus	Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Basal bark/cut stump Apply as an overall spray, wetting all areas of the plant to ground level
	Pastures, rights-of-way, commercial/industrial areas	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access)	1 L/60 L diesel See permit PER13812 (expires 30/11/2017)	Paint stump immediately after cutting or spray basal bark
Tiger pear	Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Basal bark/cut stump Apply as an overall spray, wetting all areas of plant to ground level
	Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 600 g/L (e.g. Garlon 600)	3 L/100 L water or 0.8 L/60 L diesel	Apply as a thorough foliage spray
Drooping tree pear	Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 300 g/L + picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8g/L (Grazon Extra)	500 mL/100L water	
	Non-crop areas around buildings, commercial and industrial areas, domestic and public service areas, rights-of-way	Amitrole 250 g/L + ammonium thiocyanate 220 g/L (e.g. Amitrole T)	1 mL/3 cm (inject) or 1 L/25 L (small plants/regrowth)	Tree pears may take up to 12 months to die Respraying may be needed in some cases Consult label
Velvety tree pear	Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Basal bark/cut stump Apply as an overall spray, wetting all areas of plant to ground level
	Non-crop areas around buildings, commercial and industrial areas, domestic and public service areas, rights-of-way	Amitrole 250 g/L + ammonium thiocyanate 220 g/L (e.g. Amitrole T)	1 mL/3 cm (inject) or 1 L/25 L (small plants/regrowth)	Tree pears may take up to 12 months to die Respraying may be needed in some cases Consult label
Spiny pest pear Westwood pear Devil's rope pear Snake cactus	Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Basal bark/cut stump Apply as an overall spray, wetting all areas of plant to ground level



Snake cactus (*Cylindropuntia spinosior*)



Coral cactus (*Cylindropuntia fulgida*)



Hudson pear (*Cylindropuntia rosea*)



Jumping cholla (*Cylindropuntia prolifera*)



Prickly pear (*Opuntia stricta*)



Bunny ears (*Opuntia microdasys*)



Tiger pear (*Opuntia aurantiaca*)



Riveria pear (*Opuntia elata*)



Drooping tree pear (*Opuntia monacanta*)



Devil's rope pear (*Cylindropuntia imbricata*)



This fact sheet is developed with funding support from the Land Protection Fund.

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# Lantana

*Lantana camara*



Currently, lantana covers more than 5 million ha of subcoastal New South Wales to Far North Queensland. Small infestations of lantana have also been found in central west Queensland, the Northern Territory, Western Australia, South Australia and Victoria. Efforts are under way to control these.

Lantana is mainly spread by fruit-eating birds and mammals. It forms dense thickets that smother and kill native vegetation and are impenetrable to animals, people and vehicles.

Research indicates more than 1400 native species are negatively affected by lantana invasion, including many endangered and threatened species. As lantana is a woody shrub that has thin, combustible canes, its presence can also create hotter bushfires, altering native vegetation communities and pastures.



## Legal requirements

All lantana species (*Lantana camara* and *Lantana montevidensis*) are restricted invasive plants under the *Biosecurity Act 2014*. They must not be given away, sold, or released into the environment without a permit. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants and animals in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

## Description

*Lantana camara* is a heavily branched shrub that can grow in compact clumps, dense thickets or as a climbing vine.

The stems are square in cross section, with small, recurved prickles. Most leaves are about 6 cm long and are covered in fine hairs. They are bright green above, paler beneath and have round-toothed edges. Leaves grow opposite one another along the stem. When crushed the leaves produce a distinctive odour.

Flowers appear throughout most of the year in clustered, compact heads about 2.5 cm in diameter. Flower colours vary from pale cream to yellow, white, pink, orange and red. Lantana produces round, berry-like fruit that turn from glossy green to purplish-black when ripe.

## Life cycle

Flowering and germination occurs all year round but peaks after summer rains. Several thousand seeds can be produced per square metre and these can remain viable for several years.

Research indicates some ornamental lantana varieties have the ability to set seed and can spread vegetatively. They also produce some viable pollen and have the potential to cross-pollinate with wild forms, creating new varieties that could naturalise in the environment.

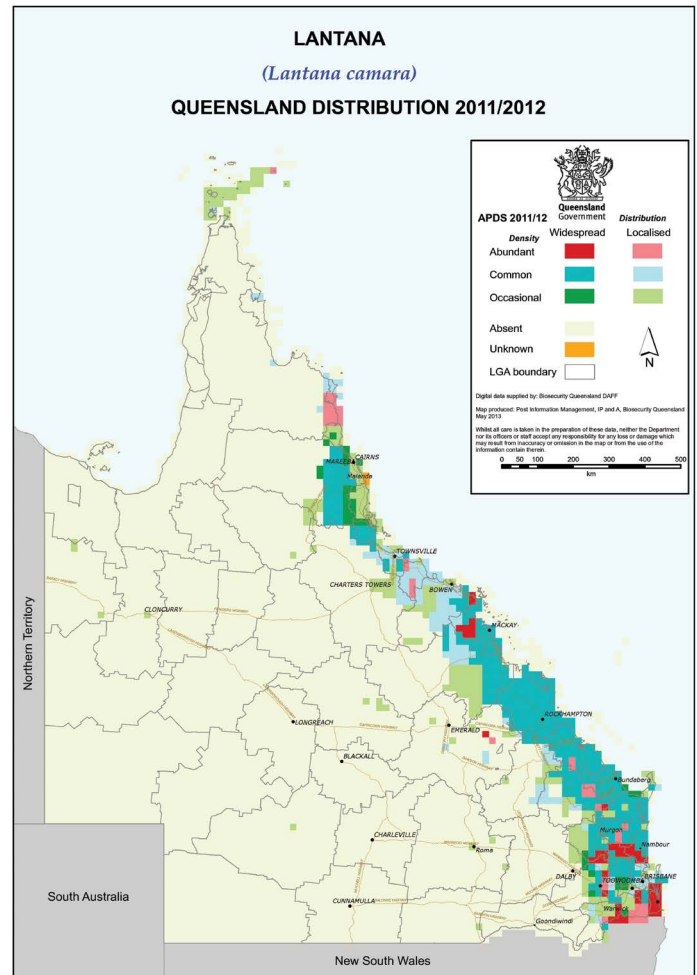
If the number of naturalised varieties increase due to genetic drift from ornamental varieties, it will make finding effective biological control agents even more difficult and potentially extend the climatic tolerances and range of the weed's spread.

## Methods of spread

Spread mostly through the garden ornamental trade, by fruit eating birds and mammals.

*Lantana camara* can also spread via a process known as layering, where horizontal stems take root when they are in contact with moist soil. It will also reshoot from the base of vertical stems.

## Map 1. Distribution of *Lantana camara* in Queensland



## Habitat and distribution

*Lantana camara* is native to the tropical and subtropical regions of North, Central and South America.

*Lantana camara* is found throughout most coastal and subcoastal areas of eastern Australia, from the Torres Strait islands to southern New South Wales. It grows in a wide variety of habitats, from exposed dry hillsides to wet, heavily shaded gullies.

## Toxicity

Many lantana varieties are poisonous to stock. It is difficult to tell which varieties are toxic so it is better to treat all forms as potentially poisonous. The toxins in lantana include the triterpene acids, lantadene A (rehmannic acid), lantadene B, and their reduced forms.

Most cases of lantana poisoning occur when new stock are introduced into lantana-infested areas. Stock bred on lantana-infested country avoid lantana unless forced to eat it due to lack of other fodder. Young animals introduced to lantana areas are most at risk.

Symptoms of lantana poisoning depend on the quantity and type of lantana consumed and, under some circumstances, the intensity of light to which the animals are exposed.

Early symptoms of depression are noticeable, with head swaying, loss of appetite, constipation and frequent urination. After a day or two the eyes and the skin of the nose and mouth start yellowing with jaundice, and the muzzle becomes dry and warm. The eyes may become inflamed and have a slight discharge. The animal also becomes increasingly sensitive to light. Finally, the muzzle becomes inflamed, moist and very painful ('pink nose'). Areas of skin may peel and slough off. Death commonly occurs 1–4 weeks after symptoms occur. Death from acute poisoning can occur 3–4 days after eating the plant.

If animals show any of the early symptoms, they should be moved to lantana-free areas, kept in the shade and monitored. Veterinary treatment should be sought immediately. Some remedies may include intravenous fluids, treating skin damage with antibiotics, or drenching with an activated charcoal slurry.

Care should be taken when introducing new or young animals into a paddock if lantana is present. Ensure they have enough fodder to stop them eating lantana in quantities sufficient to result in poisoning. During drought, animals should not be placed in lantana-infested areas without alternative food.

## Control

### Managing *Lantana camara*

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by *Lantana camara*. This fact sheet provides information and some options for controlling *Lantana camara*.

A general principle is to commence control programs in areas of light infestations and work towards the denser infestations using a mix (integration) of control methods gives the best results. Size, density and geographic location of infestations are important considerations for choosing which mix of control methods to use.

For large lantana infestations, treatment with herbicides by foliar spraying is usually not economically feasible. However, fire, dozing/stick raking, slashing/cutting, aerial helicopter spraying can reduce dense infestations, making follow-up spot treatments with chemicals more economically viable.

*Lantana camara* seed banks remain viable for at least four years, so follow-up control to kill seedlings before they mature is vital to ensure initial management efforts to control the parent bush are not wasted.

Appropriate fire regimes may become part of a management program to ensure *Lantana camara* invasiveness is reduced and pasture is maintained.

Removal of *Lantana camara* within areas of remnant vegetation may require a permit under the *Vegetation Management Act 1999*. Further information should be sought from the Department of Natural Resources and Mines before works commence.

## Mechanical control

Stick raking or ploughing can be effective in removing standing plants. However, regrowth from stumps and/or increased seedling germination in disturbed soil is common and the site will require follow-up treatment.

Grubbing of small infestations—for example, along fence lines—can be a useful and effective method of removing plants, although this is time consuming.

Repeated slashing can also reduce the vigour of lantana, exhausting its stored resources and reducing its likelihood of re-shooting.

Some locations—for example, very steep inclines or gullies—are not suitable for mechanical control options because of the danger of overturning machinery and soil erosion.

## Fire

Regular burning will reduce the capacity of plants to survive; however, initial kill rates are variable.

The effectiveness of this method will depend on the suitability of available fuel loads, fire intensity, temperature, relative humidity, soil moisture and season.

Pasture re-establishment can then provide competition to inhibit lantana seed germination. Fire is not recommended in non-fire tolerant vegetated areas such as rainforest, or wooded or plantation areas.

A typical control program for fire may include:

- exclude stock to establish a pasture fuel load
- burning (may require a permit)
- sow improved pastures—consult your local Biosecurity Queensland officer for advice
- continue to exclude stock until pasture has established and seeded
- burn again in summer before rain and spot spray *Lantana camara* regrowth when > 0.5 m high and when it is actively growing (see Table 1).

## Biological control

Since 1914, 32 biological control agents have been introduced into Australia in an attempt to control lantana. Eighteen have established, of which several insect species cause seasonal damage, reducing the vigour and competitiveness of lantana in some areas.

Biosecurity Queensland research programs continue to investigate agents suitable for release in Australia, and test the viability of these agents in an effort to identify more effective biological control agents.

It is important to remember that biological control alone should not be relied upon for managing lantana infestations. Consideration should be given to other available control techniques.



The four most important biological control agents are:

- **sap-sucking bug (*Teleonemia scrupulosa*)**  
Found in dry areas from Cooktown to Wollongong, this small, mottled, bug feeds on the underside of leaves, growing tips and flower buds, causing the leaves to drop early and stopping the plant from flowering.
- **leaf-mining beetle (*Uroplata girardi*)**  
Found in most lantana infestations from Cape Tribulation to Sydney as well as around Darwin, except in very dry or high altitude areas. The adult beetles are dark brown. They shelter in curled leaves and feed on the upper leaf surfaces. Larvae feed in leaves causing blotches to spread across the leaf. This beetle reduces plant vigour and can suppress flowering.
- **leaf-mining beetle (*Octotoma scabripennis*)**  
Found in most lantana infestations from Atherton to Wollongong. Adults of this species feed on the upper leaf surface, while larvae feed and mine the centre of the leaf and cause blotches. This activity reduces plant vigour and can suppress flowering.
- **seed-feeding fly (*Ophiomyia lantanae*)**  
Found from Cape Tribulation to Eden in New South Wales and also around Darwin and Perth. *Ophiomyia* is a small black fly that feeds on flowers and lays eggs on the green fruits. The maggots of the fly eat the seed and make the fruit unattractive to birds, reducing seed spread.

Other agents such as *Aconophora compressa* (a stem-sucking bug) and *Leptobyrsa decora* (a sap-sucking bug) have caused some damage in specific geographic areas.

**Note:** Landholders are advised not to consume their time collecting established insects for distribution. Due to their own ability to disperse, these insects will be periodically/seasonally present in areas that are climatically suitable for them.

## Herbicide control

Herbicide recommendations for lantana are shown in Table 1. Users of herbicides have a legal obligation to read herbicide labels and use only the registered rates.

Variation in results can be a result of inconsistent application methods, mix rates or seasonal variation. Red-flowered and pink-edged red-flowered lantana are often considered the most difficult to control because their leaves are often smaller and tougher. However, herbicides can kill these varieties if you carefully follow application procedures.

For single-stemmed lantana, basal bark spraying and cut stump methods also give good results at any time of year (but best when the plant is actively growing). On multi-stemmed varieties, you will obtain best results by carefully applying herbicide to each stem.

When treating actively growing plants less than 2 m high, overall spraying of foliage to the point of run-off is recommended. Splatter gun techniques are also effective and particularly useful in hard-to-access areas. This is best done in autumn—when sap flows draw the poison down into the root stock, but before night temperatures get too cold.

Remove grazing animals from spray areas during and soon after treatment. Stress can cause increased sugar levels in the leaves of lantana plants, making them more palatable.

Landholders and contractors should check if the property is situated in a hazardous area. This prevents the use of some herbicides, as defined in the *Agricultural Chemicals Distribution Control Act 1966*.

## Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).



**Table 1. Herbicides for control of *Lantana camara***

Situation	Herbicide	Rate	Optimum time <sup>1</sup>	Comments
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 200 g/L (e.g. Flagship 200)	500 mL to 1 L/100 L water	October to April	Thorough wetting of plants is required, higher rate should be used for larger plants
	Fluroxypyr 333 g/L (e.g. Starane Advanced)	300–600 mL/100 L water		
	Fluroxypyr 400 g/L (e.g. Comet 400)	250–500 mL/100 L water		
Domestic areas, commercial, industrial and public service areas, agricultural non-crop areas, forests and rights-of-way	Glyphosate 360 g/L (e.g. Roundup Biactive, Glyphosate 360)	1 L/100 L water	October to April	Wet plant thoroughly Glyphosate affects any green plant it comes into contact with Glyphosate is available in a range of strengths Consult labels for rates for other glyphosate formulations
	Glyphosate 450 g/L (e.g. Glyder 450)	800 mL/100 L		
	Glyphosate 540 g/L (e.g. Roundup PowerMax)	660 mL/100 L		
	Glyphosate 700 g/kg (e.g. Macspred Dri 700)	500 g/100 L		
Agricultural non-crop areas, commercial and industrial areas, pastures and rights-of-way	2,4-D 300 g/L + Picloram 75 g/L (e.g. Tordon 75-D)	0.65 L/100 L water	March to May	Thoroughly wet foliage and soil around base of plant Legumes are affected if sprayed
Non-crop and rights-of-way	Dichlorprop 600 g/L (e.g. Lantana 600)	500 mL/100 L water	December to April	Must thoroughly wet all leaves Please refer to product label for situation details
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L + Picloram 100 g/L + aminopyralid 8 g/L (e.g. Grazon Extra <sup>®</sup> )	350 mL to 500 mL/100 L water	Summer to autumn	Wet plant thoroughly Use the higher rate on plants over 1 m Legumes may be affected if sprayed
	Triclopyr 300 g/L + Picloram 100 g/L (e.g. Conqueror)			
Pastures, rights-of-way and industrial	2,4-D amine 625 g/L (e.g. Ken-Amine 625)	320 mL/100 L water	March to May	Use a coarse spray with sufficient pressure to penetrate canopy and wet stems as well as foliage. Spray at the end of a wet Summer (March to May). Defoliation should occur but respraying of new growth will be necessary in following Autumn. Broadcast grass seed and keep stock off following Summer to allow the pasture to establish. Damage may result to pasture legumes. Red-flowered lantanas are more resistant to 2,4-D
	2,4-D amine 700 g/L (e.g. Amicide Advance 700)	285 mL/100 L water Consult label for other formulations of 2,4-D		
Native pastures, rights-of-way, commercial and industrial areas	Metsulfuron-methyl 600 g/kg (e.g. Associate, Lynx <sup>®</sup> 600)	10 g/100 L water plus wetter	March to May	Plants up to 2 m tall Thoroughly wet all foliage and stems Spray should penetrate throughout the bush Addition of a wetting agent e.g. Pulse is recommended Results variable Not found effective in tropics Follow-up sprays are necessary
Native pastures, rights-of-way, commercial and industrial areas	Glyphosate 360 g/L (e.g. Weedmaster Duo, Glyphosate 360) plus Metsulfuron-methyl 600 g/L (e.g. Associate, Ken-Met 600) + tank mix	400 mL glyphosate 360 + 3 g metsulfuron/100 L water	March to May	Apply to actively growing bushes up to 2 m tall Spray to thoroughly wet all foliage and stems Spray to penetrate throughout the bush Do not apply during periods of summer drought stress Addition of a wetting agent e.g. Pulse is recommended
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 140 g/L + Aminopyralid 10 g/L (e.g. Hotshot)	500–700 mL /100 L water/100 L water	October to April	Apply to actively growing plants. Spray all foliage, including stems, to the point of run-off. Use the lower rate on seedlings and regrowth 0.5–1.2 m tall and the higher rate on plants 1.2–2 m tall
	<b>(i) Basal bark</b>			
	<b>(ii) Cut stump</b>			
	Triclopyr 600 g/L (e.g. Garlon 600)	1 L/60 L diesel	Any time Best results when actively growing	(i) Apply to lower 40 cm of every stem Must ensure complete coverage around stem (ii) Cut close to ground level Immediately apply herbicide
Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access)				
Picloram 44.7 g/L + Aminopyralid 4.47 g/L (e.g. Vigilant II <sup>®</sup> Herbicide Gel)	3–5 mm gel		(ii) If diameter of stump is > 20 mm, use a minimum of 5 mm gel thickness	

**Table 1. Herbicides for control of *Lantana camara* (continued)**

Situation	Herbicide	Rate	Optimum time <sup>1</sup>	Comments
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Glyphosate 360 g/L (e.g. Roundup, Weedmaster Duo)	Undiluted	Any time Best results when actively growing	APVMA permit PER11463 (expires 30/06/2018) Prior to using the herbicides listed under PER11463 you must read or have read to you and understand the conditions of the permit To obtain a copy of this permit visit <a href="http://www.apvma.gov.au">www.apvma.gov.au</a>
	<b>Splatter gun</b>			
	Glyphosate 360 g/L (e.g. Weedmaster Duo, Glyphosate 360)	1:9 glyphosate + water	October to April	2 x 2 mL dose per 0.5 m height of lantana Addition of Pulse Penetrant may improve control
	Metsulfuron methyl 600 g/L (Associate, Lynx® 600)	2 g/L water	March to May	
<b>Aerial</b>				Follow label directions for equipment and other requirements for aerial application
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L+ Picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L (Grazon Extra)	10 L/ha	When actively growing	Helicopter only Minimum of 200 L water per ha Follow-up re-spray will be required Do not burn within six months of treatment
	Triclopyr 300 g/L + Picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L (Grazon Extra) + 2,4-D amine 625 g/L (e.g. Ken-Amine 625)	1.5 L + 6 L 2,4-D /ha	When actively growing	Helicopter only Minimum of 200 L water per ha Follow-up re-spray will be required Do not burn within six months of treatment
Non-crop and rights-of-way	Dichlorprop 600 g/L (e.g. Lantana 600)	6–8 L/ha	When plant actively growing	

<sup>1</sup>Optimum times are only a guide. *Lantana camara* must be actively growing for the herbicide to work.

Labels often recommend the additional use of a wetting agent or surfactant within the mix. Herbicides types vary in their selectivity against other species and soil residual.

**Read the label carefully before use and always use the herbicide in accordance with the directions on the label.**



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# Identification Guide:

## Lantana flowers

There are five main flower colour varieties of the weedy form of *Lantana camara* in Australia.

Photo: Jeff Wright



### Pink *Lantana camara*




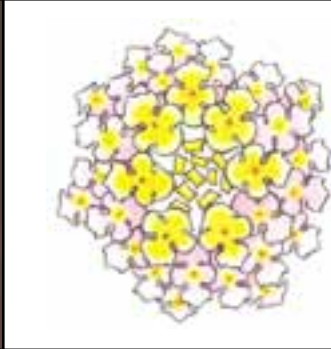
-  — | **Bud:** pink/parchment
-  — | **Middle ring:** yellow throat, pale yellow petals
-  — | **Outer ring:** orange throat, pale or dark pink petals

Photo: Jeff Wright



### White *Lantana camara*




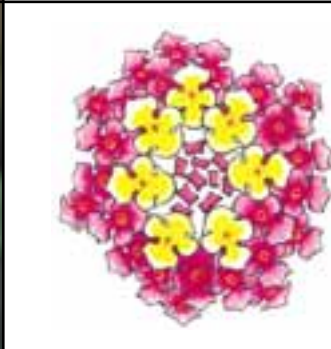
-  — | **Bud:** cream
-  — | **Middle ring:** yellow throat, pale yellow petals
-  — | **Outer ring:** orange or yellow throat, lilac petals

Photo: Mick Richards



### Pink-edged Red *Lantana camara*


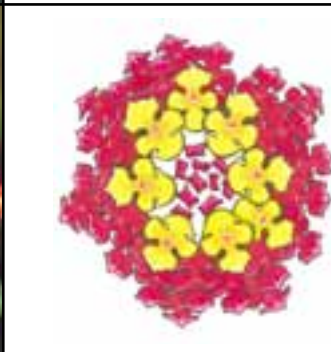
-  — | **Bud:** pink to dull red
-  — | **Middle ring:** orange throat, pale yellow to orange petals
-  — | **Outer ring:** orange throat, with two-toned pink to red colour petals (inner darker than outer)

Photo: Alan Fletcher Research Station



### Red *Lantana camara*




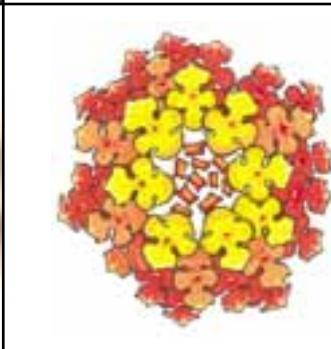



-  — | **Bud:** blood red
-  — | **Middle ring:** yellow throat with yellow petals
-  — | **Outer ring:** red throat with red petals

Photo: Mick Richards



### Orange *Lantana camara*

-  — | **Bud:** orange
-  — | **Middle ring:** yellow to orange throat, yellow petals
-  — | **Outer ring:** orange throat, orange petals

Other weedy and ornamental forms of lantana include:

Photo: Jeff Wright



**Hawaiian pink *Lantana camara***






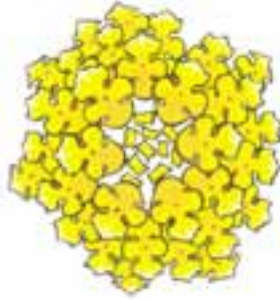
-  — | **Bud:** orange
-  — | **Middle ring:** yellow throat, yellow petals
-  — | **Outer ring:** pink to dark pink throat, dark pink to crimson petals

Photo: Mick Richards



**Ornamental Yellow *Lantana* spp.**

Ornamental varieties come in a range of other flower colours.





-  — | **Bud:** greeny yellow
-  — | **Middle and outer ring:** ochre yellow throat and petals

Photo: Glenn Leiper



**Lilac *Lantana montevidensis* (Creeping lantana)**





-  — | **Bud:** lilac
-  — | **Middle and outer ring:** white throat, lilac to mauve petals

Photo: Mick Richards



**Ornamental Lilac *Lantana montevidensis***








-  — | **Bud:** lilac
-  — | **Middle and outer ring:** white to yellow throat, lilac to mauve petals

Photo: Mick Richards



**Ornamental White *Lantana montevidensis***



-  — | **Bud:** white to cream
-  — | **Middle ring:** yellow throat, white petals
-  — | **Outer ring:** pale yellow throat, white petals

Both species and all ornamental varieties of lantana are considered to be weeds.

For more information: <[www.nrm.qld.gov.au/pests/wons/lantana](http://www.nrm.qld.gov.au/pests/wons/lantana)>

# Singapore daisy

*Sphagneticola trilobata*



Singapore daisy is a mat forming ground cover. It spreads rapidly and smothers seedling, ferns and shrubs and will out-compete them for survival. Singapore daisy is invading all different environmental areas, even living in sand. Singapore daisy will even grow through lawns if uncontrolled.

## Legal requirements

Singapore daisy is a restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment without a permit. The Act

requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants and animals in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.



## Description

Singapore daisy is a vigorous ground cover or low climbing plant. The leaves are lush glossy green, usually 3 lobed and in pairs up the stem 4–18 cm long and 1.5–8 cm wide.

Singapore daisy produces yellow to orange-yellow daisy flowers about 2 cm. The flowers are held above the leaves on short leaf stalks. Seeds are elongated, brown 4–5 mm long. The amount of seed per flowers varies greatly.

## Life cycle

Flowers mostly spring to autumn but will flower all year round. Most reproduction is vegetative, from stems nodes.

## Methods of spread

Singapore daisy produces variable amounts of seeds but is mainly spread by cuttings via slashing and pruning.

## Habitat and distribution

Singapore daisy is a garden escapee and native of tropical America. It prefers moist areas on a range of soil types. Found in gardens, parks, bushland, disturbed areas, along roadsides, lawns and footpaths.

It is becoming a problem by invading wetlands, irrigated areas and around drains.

Present in all coastal areas of Queensland.

## Control

### Managing Singapore daisy

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by Singapore daisy. This fact sheet provides information and some options for controlling Singapore daisy.

As Singapore daisy likes to establish in disturbed areas, pre plan revegetation of the area you are clearing. Take extra care when mowing or slashing around areas planted where Singapore daisy is planted so small fragments are not spread to other locations.

## Physical control

Hand pull and dig up runners. The plant will regrow from the smallest cutting so dispose of waste carefully. Either burn waste or put into a black plastic bag and place in the sun for a few days before putting into the refuse bin. Repeat hand pulling will need to be done as new lawns.

## Herbicide control

An off-label use permit allows the use of various herbicides for the control of Singapore daisy in non-agricultural areas, bushland and forests.

See Table 1 for treatment options allowed by the permit.

Prior to using the herbicides listed under PER11463 you must read or have read to you and understand the conditions of the permit. To obtain a copy of this permit visit [www.apvma.gov.au](http://www.apvma.gov.au).

## Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).



**Table 1. Herbicides for control of Singapore daisy**

Situation	Herbicide	Rate	Registration status	Comments
Native pastures, rights-of-way, commercial and industrial areas	Metsulfuron-methyl 600 g/L (e.g. Nufarm Associate)	10 g per 100 L water plus wetting agent	APVMA PER11463 (permit expires 30/06/2018)	Spray thoroughly to wet all foliage, but not to cause run-off Minimise contact with desirable species Only use products registered for Singapore daisy

**Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.**

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Fact sheets are available from Department of Agriculture and Fisheries (DAF) service centres and our Customer Service Centre (telephone 13 25 23). Check our website at [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au) to ensure you have the latest version of this fact sheet. The control methods referred to in this fact sheet should be used in accordance with the restrictions (federal and state legislation, and local government laws) directly or indirectly related to each control method. These restrictions may prevent the use of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of this information, DAF does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.



# **APPENDIX B RESTRICTED INVASIVE PLANTS OF QUEENSLAND FACT SHEET**

Department of Agriculture and Fisheries, Biosecurity Queensland, 2016



# Restricted invasive plants of Queensland



## The new Biosecurity Act

The *Biosecurity Act 2014* protects Queensland's economy, biodiversity and people's lifestyles from the threats posed by invasive pests and diseases

Under the Act, certain species of invasive plants are listed as 'restricted' biosecurity matter.

Species not listed as restricted may be listed as prohibited under the Act or may be declared by a local government level under local laws.

Australian Government legislation administered by the Australian Department of Agriculture also applies to the import of all plants into Australia.



## What is restricted matter?

Restricted matter is listed in the Act and includes a range of invasive plants that are present in Queensland. These invasive plants are having significant adverse impacts in Queensland and it is desirable to manage them and prevent their spread, thereby protecting un-infested parts of the State.

The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is called a general biosecurity obligation (GBO).

The specific restriction requirements also apply to a person when dealing with restricted invasive matter. The different restriction requirements address the risk posed by that invasive plant.

A person may apply for a restricted matter permit. This permit may allow dealings with the invasive plant contrary to the restriction requirement but under strict conditions. The purposes include commercial use, biological control or scientific research about the invasive plant.

## Restricted invasive plants that are Categories 2, 3, 4 and 5

A person has the following restrictions placed upon them when dealing with these invasive plants:

### Category 2

A person must report the invasive plant within 24 hours to **13 25 23**. Your GBO requires you to take all reasonable and practical steps to minimise the risk of the plant spreading until they receive advice from an authorised officer.

### Category 3

A person must not distributed the invasive plant either by sale or gift, release it into the environment.

### Category 4

A person must not move the invasive plant.

### Category 5

A person must not keep the invasive plant.

The invasive plants listed below must be reported when found. These invasive plants cannot be moved, kept, released into the environment, or given away or sold as a plant or as something infested with its seeds:

- bitou bush (*Chrysanthemoides monilifera* ssp. *rotundifolia*)
- boneseed (*Chrysanthemoides monilifera* ssp. *monilifera*)
- bridal creeper (*Asparagus asparagoides*)
- Hudson pear (*Cylindropuntia rosea* and *C. tunicata*)
- jumping cholla (*Cylindropuntia prolifera*)
- Koster's curse (*Clidemia hirta*)
- limnocharis or yellow burrhead (*Limnocharis flava*)
- madras thorn (*Pithecellobium dulce*)
- Mexican bean tree (*Cecropia pachystachya*, *C. palmata* and *C. peltata*)

- Mexican feather grass (*Nassella tenuissima*)
- miconia (*M. calvescens*, *M. cionotricha*, *M. nervosa* and *M. racemosa*)
- mikania vine (*Mikania micrantha*)
- mimosa pigra (*Mimosa pigra*)
- bunny ears (*Opuntia microdasys*)
- riverina prickly pear (*Opuntia elata*)
- water mimosa (*Neptunia oleracea* and *N. plena*).

## Restricted invasive plants that are Category 3

The following invasive plants have restriction requirement Category 3. A person must not release these invasive plants into the environment, give away or sell as a plant or something infested with its seeds:

- African boxthorn (*Lycium ferocissimum*)
- African fountain grass (*Cenchrus setaceum*)
- African tulip tree (*Spathodea campanulata*)
- alligator weed (*Alternanthera philoxeroides*)
- annual ragweed (*Ambrosia artemisiifolia*)
- asparagus fern (*Asparagus aethiopicus*, *A. africanus*, *A. scandens*, *A. declinatus* and *A. plumosus*)
- athel pine (*Tamarix aphylla*)
- *austrorocylindropuntia* cactus with the following names:
  - cane cactus (*Austrorocylindropuntia cylindrica*)
  - Eve's pin cactus (*A. subulata*)
- badhara bush (*Gmelina elliptica*)
- balloon vine (*Cardiospermum grandiflorum*)
- bellyache bush (*Jatropha gossypifolia* and hybrids)
- blackberry (*Rubus anglocandicans*, *Rubus fruticosus aggregate*.)
- broad-leaved pepper tree (*Schinus terebinthifolius*)
- broom with the following names:
  - flax-leaf broom (*Genista linifolia*)
  - Montpellier broom (*Genista monspessulana*)
  - Scotch broom (*Cytisus scoparius*)
- cabomba (*Cabomba caroliniana*)
- camphor laurel (*Cinnamomum camphora*)
- candyleaf (*Stevia ovata*)
- cat's claw creeper (*Dolichandra unguis-cati*)
- Chilean needle grass (*Nassella neesiana*)
- chinee apple (*Ziziphus mauritiana*)
- Chinese celtis (*Celtis sinensis*)
- cholla cactus with the following names:
  - coral cactus (*Cylindropuntia fulgida*)
  - devil's rope pear (*Cylindropuntia imbricata*)
  - snake cactus (*Cylindropuntia spinosior*)
- Dutchman's pipe (*Aristolochia* spp. other than native species)

- Elephant ear vine (*Argyrea nervosa*)
- fireweed (*Senecio madagascariensis*)
- gamba grass (*Andropogon gayanus*)
- giant sensitive plant (*Mimosa diplotricha* var. *diplotricha*)
- gorse (*Ulex europaeus*)
- groundsel bush (*Baccharis halimifolia*)
- harrisia cactus (*Harrisia martinii* syn. *Eriocereus martinii*, *H. tortuosa* and *H. pomanensis* syn. *Cereus pomanensis*)
- harungana (*Harungana madagascariensis*)
- honey locust (*Gleditsia tricanthos* including cultivars and varieties)
- hygrophila (*Hygrophila costata*)
- hymenachne or olive hymenachne (*Hymenachne amplexicaulis* and hybrids)
- kudzu (*Pueraria montana* var. *lobata*, syn. *P. lobata*, *P. triloba* other than in the Torres Strait Islands)
- lantanas:
  - creeping lantana (*Lantana montevidensis*)
  - lantana or common lantana (*Lantana camara*)
- Madeira vine (*Anredera cordifolia*)
- Mesquites:
  - honey mesquite (*Prosopis glandulosa*)
  - mesquite or algarroba (*Prosopis pallida*)
  - Quilpie mesquite (*Prosopis velutina*)
- mother-of-millions (*Bryophyllum delagoense* syn. *B. tubiflorum*, *Kalanchoe delagoensis*)
- mother-of-millions hybrid (*Bryophyllum* × *houghtonii*)
- Ornamental ginger:
  - kahili ginger (*Hedychium gardnerianum*)
  - white ginger (*Hedychium coronarium*)
  - yellow ginger (*Hedychium flavescens*)
- parkinsonia (*Parkinsonia aculeata*)
- parthenium (*Parthenium hysterophorus*)
- pond apple (*Annona glabra*)
- prickly acacia (*Vachellia nilotica*)
- prickly pears:
  - common pest pear, spiny pest pear (*Opuntia stricta* syn. *O. inermis*)
  - drooping tree pear (*O. monacantha* syn. *O. vulgaris*)
  - tiger pear (*O. aurantiaca*)
  - velvety tree pear (*O. tomentosa*)
  - Westwood pear (*O. streptacantha*)
- privets:
  - broad-leaf privet or tree privet (*Ligustrum lucidum*)
  - small-leaf privet or Chinese privet (*Ligustrum sinense*)
- rat's tail grasses:
  - American rat's tail grass (*Sporobolus jacquemontii*)
  - giant Parramatta grass (*Sporobolus fertilis*)
  - giant rat's tail grass (*Sporobolus pyramidalis* and *Sporobolus natalensis*)
- rubber vines:
  - ornamental rubber vine (*Cryptostegia madagascariensis*)
  - rubber vine (*Cryptostegia grandiflora*)
- sagittaria (*Sagittaria platyphylla*)
- salvinia (*Salvinia molesta*)
- Senegal tea (*Gymnocoronis spilanthoides*)
- Siam weed (*Chromolaena odorata* and *Chromolaena squalida*)
- Sicklepods:
  - foetid cassia (*Senna tora*)
  - hairy cassia (*Senna hirsuta*)
  - sicklepod (*Senna obtusifolia*)
- Silver-leaf nightshade (*Solanum elaeagnifolium*)
- Singapore daisy (*Sphagneticola trilobata*; syn. *Wedelia trilobata*)
- telegraph weed (*Heterotheca grandiflora*)
- thunbergias:
  - laurel clockvine (*Thunbergia laurifolia*)
  - thunbergia or blue thunbergia (*Thunbergia grandiflora*)
- tobacco weed (*Elephantopus mollis*)
- water hyacinth (*Eichhornia crassipes*)
- water lettuce (*Pistia stratiotes*)
- willow (all *Salix* spp. other than *S. babylonica*, *S. × calodendron* and *S. × reichardtii*)
- yellow bells (*Tecoma stans*)
- yellow oleander or Captain Cook tree (*Cascabela thevetia* syn. *Thevetia peruviana*).

This list was correct at date of publication but may change from time to time. For the most up-to-date version visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).

## Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).



Bitou bush (*Chrysanthemoides monilifera*)



Koster's curse (*Clidemia hirta*)



Water hyacinth (*Eichhornia crassipes*)



Bellyache bush (*Jatropha gossypifolia*)



African boxthorn (*Lycium ferocissimum*)



Prickly acacia (*Vachellia nilotica*)

This fact sheet is developed with funding support from the Land Protection Fund.

Fact sheets are available from Department of Agriculture and Fisheries (DAF) service centres and our Customer Service Centre (telephone 13 25 23). Check our website at [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au) to ensure you have the latest version of this fact sheet. The control methods referred to in this fact sheet should be used in accordance with the restrictions (federal and state legislation, and local government laws) directly or indirectly related to each control method. These restrictions may prevent the use of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of this information, DAF does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.



# **APPENDIX C PROHIBITED INVASIVE PLANTS OF QUEENSLAND FACT SHEET**

Department of Agriculture and Fisheries, Biosecurity Queensland, 2016

# Prohibited invasive plants of Queensland



Bunny ears (*Opuntia rufida*)



Tropical soda apple (*Solanum viarum*)



Red witchweed (*Striga asiatica*)



Bitter weed (*Helenium amarum*)

## The new Biosecurity Act

The *Biosecurity Act 2014* protects Queensland's economy, biodiversity and people's lifestyles from the threats posed by invasive pests and diseases.

Under the Act, certain species of invasive plants are listed as 'prohibited' matter.

Species not listed as prohibited may be listed as restricted matter under the Act or may be declared by a local government under local laws.

Australian legislation administered by the Australian Department of Agriculture (DoA) also applies to the import of all plants into Australia.



## What is prohibited matter?

Prohibited matter includes a range of invasive plants and invasive animals and other types of pests and diseases listed in the Act. These plants have the potential to have significant impacts and are currently not present or known to be present in Queensland.

It is an offence to deal with prohibited matter or fail to report its presence.

'Must not deal with' includes that a person must not do any of the following with prohibited invasive plants:

- keep or possess
- conduct experiments
- produce or manufacture
- breed
- propagate
- use
- grow, raise fee or culture
- distribute
- import
- transport
- dispose of
- buy, supply or use.

## Reporting prohibited matter

All prohibited matter must be reported within 24 hours of being sighted to Biosecurity Queensland by phoning **13 25 23**.

By law, everyone has a general biosecurity obligation (GBO) to take all reasonable and practical steps to minimise the risk of the plant spreading until they receive advice from an authorised officer.

Prompt action will protect our valuable agricultural industries, natural resources and the environment.

## Invasive plants that are prohibited matter

- acacias non-indigenous to Australia (*Acaciella* spp., *Mariosousa* spp., *Senegalia* spp. and *Vachellia* spp. other than *Vachellia nilotica* and *Vachellia farnesiana*)
- anchored water hyacinth (*Eichhornia azurea*)
- annual thunbergia (*Thunbergia annua*)
- bitter weed (*Helenium amarum*)
- candleberry myrtle (*Myrica faya*)
- cholla cactus (*Cylindropuntia* spp. and their hybrids, other than *C. fulgida*, *C. imbricata*, *C. prolifera*, *C. rosea*, *C. spinosior*, and *C. tunicata*)
- Christ's thorn (*Ziziphus spina-christi*)
- Eurasian water milfoil (*Myriophyllum spicatum*)

- fanwort (*Cabomba* spp. other than *C. caroliniana*)
- floating water chestnuts (*Trapa* spp.)
- harrisia cactus (*Harrisia* spp. syn. *Eriocereus* spp. other than *H. martinii*, *H. tortuosa* and *H. pomanensis* syn. *Cereus pomanensis*)
- honey locust (*Gleditsia* spp. other than *G. triacanthos*)
- horsetails (*Equisetum* spp.)
- kochia (*Bassia scoparia* syn. *Kochia scoparia*)
- lagarosiphon (*Lagarosiphon major*)
- mesquites (all *Prosopis* spp. and hybrids other than *P. glandulosa*, *P. pallida* and *P. velutina*)
- Mexican bean tree (all *Cecropia* spp. other than *C. pachystachya*, *C. palmata* and *C. peltata*)
- miconia (*Miconia* spp. other than *M. calvescens*, *M. cionotricha*, *M. nervosa* and *M. racemosa*)
- mikania vine (*Mikania* spp. other than *M. micrantha*)
- Peruvian primrose bush (*Ludwigia peruviana*)
- prickly pear (*Opuntia* spp. other than *O. aurantiaca*, *O. elata*, *O. ficus-indica*, *O. microdasys*, *O. monacantha*, *O. stricta*, *O. streptacantha* and *O. tomentosa*)
- red sesbania (*Sesbania punicea*)
- salvinia (*Salvinia* spp. other than *S. molesta*)
- serrated tussock (*Nassella trichotoma*)
- Siam weed (*Chromolaena* spp. other than *C. odorata* and *C. squalida*)
- spiked pepper (*Piper aduncum*)
- tropical soda apple (*Solanum viarum*)
- water soldiers (*Stratiotes aloides*)
- witch weeds (*Striga* spp. other than native species).

This list was correct at date of publication but may change from time to time. For the most up-to-date version visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).

## Further information

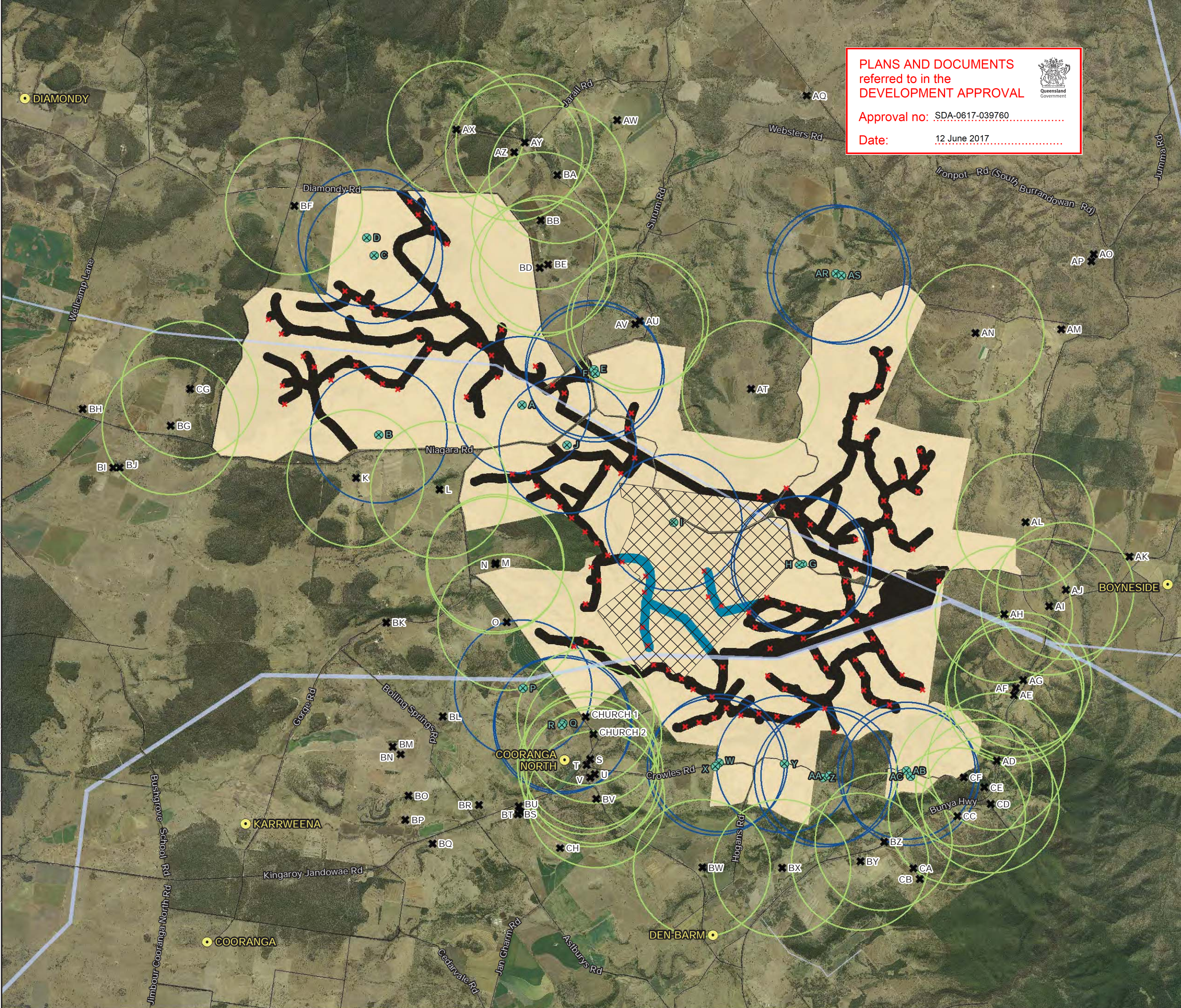
Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit [www.biosecurity.qld.gov.au](http://www.biosecurity.qld.gov.au).

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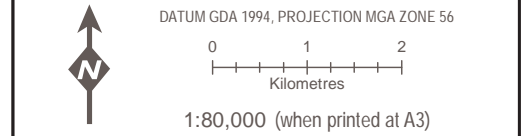
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**PLANS AND DOCUMENTS referred to in the DEVELOPMENT APPROVAL**

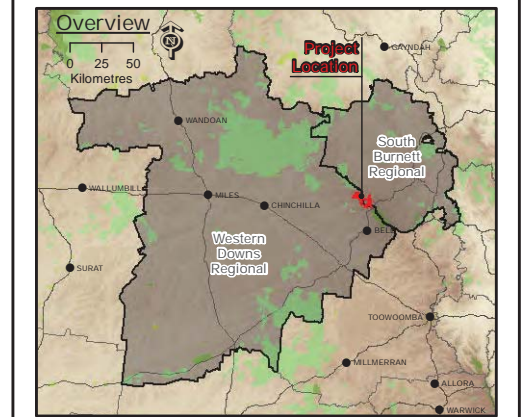
Approval no: SDA-0617-039760

Date: 12 June 2017



- Legend**
- Stage 1 Study Area
  - Extension Study Area
  - Stage 1 Project Site
  - Extension Project Site
  - Turbines
  - Locality
  - Participatory Landowners
  - Non-Participatory Landowners
  - Road
  - 1,500m setback – Participating Landowners\*
  - 1,500m setback – Non-Participating Landowners\*

**Note:**  
\*only setbacks intersecting Study Area are shown



**Data Sources:**

1. Project Site, © AECOM, 2016
2. Turbine Layout © GE CATCON, 2017
3. Service Road, Transmission Lines © AGL 2014
4. Locality, Roads © StreetPro 2011
5. Cadastral Data (DCDB) © State of Queensland (Department of Natural Resources and Mines) 2017
6. Contours 10m © Department of Natural Resources and Mines, 2013
7. Hillshade, based on the 25m DEM covering the SEQ, DNRM 2005
8. Local Government Area (LGA) boundaries © Australia Bureau of Statistics (ABS), 2011
9. Vegetation Management Watercourse and Drainage feature map (1:100 000 and 1:250 000) - version 1.4 dataset © State of Queensland (Department of Natural Resources and Mines) 2016
10. Background Image, Captured on 27/04/2011, Bing Maps
11. Surat Basin Main map 40 cm Imagery © SISP, 2013

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3. © State of Queensland (Department of Natural Resources and Mines) 2014. Data from Commonwealth of Australia (Geoscience Australia) 2009 used in creating this dataset provided under Creative Commons Attribution - Attribution licence. Updated data available at <http://ids.information.qld.gov.au/ids/>

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**COOPERS GAP WIND FARM  
Material Change of Use  
(Extension to a Wind Farm)**

**SENSITIVE LAND USE SEPARATION**

PROJECT #:	60489152	<b>Map 2</b>
CREATED BY:	BM	
LAST MODIFIED:	BM: 26/05/2017	
VERSION:	1	