



NEW HOPE
GROUP

J.9 Pest and Weed Management Plan





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PEST AND WEED MANAGEMENT PLAN

*New Acland Coal Mine
Stage 3 Project*

JANUARY 2014



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1. Introduction

1.1. Background

New Acland Coal Pty Ltd (NAC) currently operates the Mine, as a 4.8 million tonnes (product coal) per annum (Mtpa) open cut coal mine on Mining Lease (ML) 50170 and ML 50216 within Mineral Development Licence (MDL) 244, under the approval of Environmental Authority (EA) No. EPML00335713

The revised Project involves the extension and operation of the Mine, with the inclusion and progressive development of two new resource areas within MLA 50232. These resource areas are termed the Manning Vale and Willeroo resource areas. The revised Project will include mining in three new mine pits, namely, the Manning Vale West, Manning Vale East and Willeroo mine pits.

This Pest and Weed Management Plan (PWMP) addresses the management of weeds and pests related to the Study area which includes the Mine site and the revised Project site.

This plan describes how pests and weeds are to be managed in accordance with the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) and local government requirements for weeds not declared under the state legislation.

1.2. Site description

This PWMP addresses the management of all pests and weeds found during flora and fauna studies to date. The Study area is situated on predominately grazing land common to the Darling Downs. Most of the original vegetation has been cleared within the Study area due to past agriculture, grazing and mining activities. The balance consists of improved pasture, scattered clumps of trees and individual paddock trees.

1.3. Purpose

The purpose of this PWMP is to address management strategies and practices to contain existing pest and weed species and ensure no new species are introduced to the area.

2. Legislation

This Section describes the relevant Commonwealth and Queensland legislation that apply to the management and control of pests and weeds.

2.1. Commonwealth Legislation

Agricultural and Veterinary Chemicals Code Act 1994

All pesticides supplied, used or distributed in Australia are registered under this Act by the Australian Pesticides and Veterinary Medicines Authority (APVMA). All APVMA approved chemicals or products have product labels, which contain the required specific information for the usage and application rates.

2.2. Queensland Legislation

Land Protection (Pest and Stock Route Management) Act 2002 and Land Protection (Pest and Stock Route Management) Regulation 2003

The LP Act and the *Land Protection (Pest and Stock Route Management) Regulation 2003* (LP Regulation) provides for management of weeds and animal pests in Queensland. Declared pest and weeds are listed under three classes:

- Class 1 pest or weed is a species that has the potential of having serious agricultural, environmental or social impacts;
- Class 2 pest or weed is a species that has spread over substantial areas of Queensland but have serious impacts on agricultural, environmental or social aspects; and
- Class 3 pest or weed is a species that is commonly established in Queensland. The primary objective is to prevent the sale of listed species.

Landholders have an obligation to control Class 1 and 2 declared pests and weeds that are known to occur on their property and to control Class 3 pests and weeds when their property is adjacent to environmentally significant areas.

Nature Conservation Act 1992 and Nature Conservation (Wildlife) Regulation 2006

The *Nature Conservation Act 1992* (NC Act) provides for the conservation and management of Queensland's native flora and fauna. The Act prohibits the taking or destruction, without authorisation, of certain listed flora and fauna species.

The *Nature Conservation (Wildlife) Regulation 2006* (NC Regulation) lists the flora and fauna species presumed extinct in the wild, endangered, vulnerable, near threatened, least concern, international and prohibited. It states the declared management intent and the principles to be observed in any taking of or destruction for each group.

Environmental Protection Act 1994

Under the *Environmental Protection Act 1994* (EP Act) and the *Environmental Protection Regulation 2008* (EP Regulation) certain environmental features are protected within mining lease areas. These are termed 'environmentally sensitive areas' and include such features as national parks, conservation reserves, wetlands of international importance, heritage places and endangered regional ecosystems (EREs).

2.3. Local Government Legislation

Toowoomba Regional Council (TRC) has endorsed the Toowoomba Regional Council Area Pest Management Plan 2010-2014, which outlines a four year strategy and focuses on integrated pest plant and animal control across the entire TRC area.

NAC will continue to consult with TRC regarding pest and weed management strategies.

3. Site inspections

There have been a number of flora and fauna surveys conducted over the last 11 years within the Study area.

During flora surveys, the overall condition of the site vegetation was recorded, including the extent of modification and weed invasion. Detailed fauna field surveys have been completed using a combination of sampling techniques including diurnal and nocturnal census and opportunistic observations. Further survey details are provided in Chapter 7 of the EIS.

3.1. Weeds

Four declared pest plants and 19 weeds of management concern have been identified to date. The four pest plants declared under the LP Act are defined in Table 1. Other plants that are not declared but are of management concern are described in Table 2.

Table 1 Declared Pest Plants Identified at the Study area

Scientific Name	Common Name	Location	Declared Status*
<i>Bryophyllum delagoense</i>	Mother of millions	Uncommon, localised distribution	Class 2
<i>Lycium ferocissimum</i>	African boxthorn	Scattered distribution in grazing lands of the Study area, usually within disturbed remnant vegetation.	Class 2
<i>Opuntia tomentosa</i>	Velvety tree pear	Occurs in low-moderate abundance within most areas of remnant vegetation in the Study area.	Class 2
<i>Opuntia stricta</i>	Prickly pear	Occurs in low abundance, not as common as velvet tree pear.	Class 2

*Status under LP Act

Table 2 Pest Plants of Management Concern Identified at the Study area

Scientific Name	Common Name	Location
<i>Acacia farnesiana</i>	Mimosa bush	Only occasionally seen in grazing or cultivation lands
<i>Cirsium vulgare</i>	Spear thistle	Low-moderate abundance in grazing/grassland areas and grazing lands. Impacting on native grasslands.
<i>Conyza spp.</i>	Fleabane	Only occasionally seen in grazing or cultivation lands
<i>Echinochloa colona</i>	Awnless barnyard grass	Only occasionally seen in grazing or cultivation lands
<i>Echinochloa crus-galli</i>	Barnyard grass	Only occasionally seen in grazing or cultivation lands
<i>Eragrostis curvula</i>	African lovegrass	Forms dense colonies in roadside easements. Competing with native grasses (i.e. <i>Homopholis belsonii</i>) in some areas.
<i>Gomphocarpus fruticosus</i>	Narrow-leaved cotton bush	Low-moderate abundance in grazing/grassland areas and grazing lands. Impacting on native grasslands.
<i>Melinis repens</i>	Red natal grass	Only occasionally seen in roadside easements
<i>Paspalum dilatatum</i>	Paspalum grass	Only occasionally seen in grazing or cultivation lands

Scientific Name	Common Name	Location
<i>Phyla canescens</i>	Lippia	Occurs in low-moderate abundance along some areas of Lagoon Creek
<i>Phytolacca octandra</i>	Inkweed	Occurs occasionally within the revised Study area
<i>Sida rhombifolia</i>	Paddy's lucerne	Occurs occasionally within the revised Study area
<i>Verbena tenuisecta</i>	Mayne's pest	Common in grazing/grassland areas. Competes with native species in grassland areas.
<i>Xanthium pungens</i>	Noogoora burr	Common along Lagoon Creek in grazing areas
<i>Xanthium spinosum</i>	Bathurst burr	Only occasionally seen in grazing or cultivation lands
<i>Zinnia peruviana</i>	Wild zinnia	Particularly abundant and invasive in some natural grassland and woodland areas

The highly disturbed nature of the Study area has facilitated the introduction and spread of many introduced species.

Numerous invasive grasses were recorded, including green panic and African lovegrass. These grasses are competing with remnant native species observed along the roadside easements adjacent and within the Study area.

In some areas these invasive grasses form dense colonies excluding the establishment and growth of native species including rare species such as Belson's panic. Numerous agricultural weeds were common in the areas used for cropping and grazing and have become established in remnant woodland and grassland, having to some extent improved the economic viability of the land use.

3.2. Introduced fauna

The introduced fauna known to occur within the Study area includes the Cane toad (*Rhinella marina*), Indian myna (*Acridotheres tristis*), Common starling (*Sturnus vulgaris*), Brown hare (*Lepus capensis*), House mouse, Black rat (*Rattus rattus*), Fox (*Vulpes vulpes*), Feral pigs (*Sus scrofa*), rabbit, wild dog and Feral cat (*Felus catus*).

4. Potential impacts

4.1. Weeds

Potential impacts of invasive weed species include loss of habitat for native plants and animals and subsequent loss of biodiversity and safety hazards. Specific impacts known to be associated with each of the four declared species are listed in Table 3, and species information sheets are included in Appendix A.

Table 3 Potential Impact of Declared Pest Plants Identified within the Study area

Common Name	Species Name	Potential Impacts
Mother of millions	<i>Bryophyllum delagoense</i>	Mother of millions, especially their flowers, are poisonous to stock and occasionally cause a significant number of cattle deaths (DAFF 2013).
African boxthorn	<i>Lycium ferocissimum</i>	African boxthorn aggressively invades pastures, reduces useability and provides a haven for pest animals such as rabbits. It forms impenetrable, sharp-spined thickets, which can inhibit the movement of stock and hinders mustering (DAFF 2013a).
Velvety tree pear	<i>Opuntia tomentosa</i>	Prickly pear species are vigorous in hot, dry conditions causing other plants to lose vigour or die (DAFF 2013b).
Prickly pear	<i>Opuntia stricta</i>	This species can reduce biodiversity by suppressing native plant growth (DAFF 2013b).

4.2. Introduced fauna

Potential impacts of invasive pest species include safety hazards, erosion, loss of habitat for native flora and fauna and subsequent loss of biodiversity. Specific impacts known to be associated with each species are listed in Table 4, and species information sheets are included in Appendix A.

Table 4 Potential Impact of Pests Identified within the Study area

Common Name	Species Name	Potential Impacts
Common starling	<i>Sturnus vulgaris</i>	The common starling causes nuisance to humans rather than real damage to humans and agriculture (DAFF 2013c).
Cane toad	<i>Rhinella marina</i>	The cane toad is poisonous at all stages of its life cycle and most native frog larvae and many aquatic invertebrates are dramatically affected by their presence. Pressure from cane toads may displace native animals (frogs and other species) where they already suffer due to manipulation of their habitat by humans and grazing animals (DAFF 2013d).
Indian myna	<i>Acridotheres tristis</i>	Indian Mynas reduce the breeding success of some native parrot species, and damage fruit, vegetable and cereal crops (DAFF 2013e).
Feral cats	<i>Felius catus</i>	Feral cats prey on local native fauna and provide a vector for ticks (DAFF 2013f).
Fox	<i>Vulpes vulpes</i>	Foxes prey on local native fauna (DAFF 2013g).

Black rat	<i>Rattus rattus</i>	Rats are a hygiene risk around amenity blocks and lunch rooms (DAFF 2013h).
Brown hare	<i>Lepus capensis</i>	Hares are known to cause erosion through the depletion of vegetation (Jarman & Stoft 2008).
Mice	<i>Mus musculus</i>	Mice can cause a hygiene risk around amenity blocks and lunch rooms (DAFF 2013h).
Feral pigs	<i>Sus scrofa</i>	Pigs kill and eat small stock, damage pasture and crops by grazing, trampling, and uprooting the ground, and damage stored grain facilities, fence lines and watering points. They also carry diseases.
Wild Dogs	<i>Canis lupus familiaris</i>	Wild dogs prey on local native fauna
Rabbits	various	Cause erosion and can spread disease

5. Pest and Weed Management Actions

5.1. Objectives

The objectives of this PWMP are as follows:

- To ensure the safety and health of personnel on the New Acland Coal Mine;
- To comply with the LP Act;
- To prevent new established weeds and pest species on the New Acland Coal Mine;
- To control and limit the spread of existing weeds and pests on the New Acland Coal Mine; and
- To maintain the current biodiversity on the New Acland Coal Mine.

These objectives will provide the framework for evaluating the effectiveness of the PWMP.

5.2. Roles and Responsibilities

NAC undertakes periodic consultation with TRC to keep up to date with pest and weed management issues.

The roles and responsibilities of the various stakeholders related to the management and actions of this PWMP are outlined in Table 5.

Table 5 Management and monitoring roles and responsibilities

Role	Responsibility
All employees	Report outbreaks and sightings of declared plants and animals
Senior Environmental Advisor	Manage independent consultant and pest and weed contractors and maintain records, carry out bi-monthly environmental inspection of site, monitor and review the effectiveness of the PWMP
Acland Pastoral Company Manager	Manage pest and weed contractors and maintain records of pest management for APC land
Independent consultant	To monitor and review the effectiveness of the PWMP
Pest contractor	Implement pest control activities and ensure required specifications are met
Weed contractor	Implement weed control activities and ensure required specifications are met

5.3. Weed Prevention Methods

NAC will continue to implement weed hygiene measures to reduce the spread of existing weeds, and reduce the risk of introducing new weeds to the Study area.

All machinery that is entering NAC, including but not limited to light vehicles, heavy vehicles and mobile plant equipment is washed down in the washdown bay when the following is applicable:

- Before a machine is to commence work in areas that require interaction with topsoil used for stockpiles or vegetation
- Before a machine is due to work in an environmentally sensitive area

- After leaving areas outside the ML that are not designated roads

Weeds that are cleared as part of clearing or topsoil stripping operations are disposed of within the mine spoil areas where the ability for them to reproduce is significantly reduced.

5.4. Weed control methods

5.4.1. Integrated management

The concept of integrated management involves the use of a variety of control methods described below. The integrated management method is ideal to use across broad areas that may be constrained by a number of environmental, safety or other concerns that a single management option is insufficient to work effectively and address the concerns. Controlled grazing of areas adjacent to the mine site is an effective method of weed control that can form part of integrated weed management for the study area.

The most appropriate control methods will be selected for individual outbreaks within the Study area, in consultation with pest contractors and as per guidelines issued by the TRC.

5.4.2. Controlled burns

A controlled burn in areas of sufficient infestation of some weed species is a control measure that may be implemented. Controlled burns would be commenced in the colder months of the year and in a manner that allows for adequate control of the fire to prevent damage to neighbouring properties. Controlled burns have a high weed control success when used in conjunction with the application of appropriate herbicides.

Prior to any controlled burns there is a requirement to obtain a Permit to Light from the Rural Fire Brigade. If this method is to be adopted, and is likely to affect external parties, it would be undertaken in consultation with landowners and interested stakeholders.

5.4.3. Manual Removal

Manual removal is an intensive, effective method of eradicating infestation in instances of isolated weed presence. The overall success of manual removal of weeds is based on the ability to remove any material that may result in regeneration of the species; this includes but is not limited to root systems, branches, leaves, seeds and other reproductive material.

This method is best applied to areas where the species have only recently started to occur or at the end of an intensive treatment regime where there are only isolated plants occurring.

5.4.4. Herbicide Application

Herbicide control is the most commonly used control method for weed species. Herbicide treatments are commonly used in conjunction with other control methods or repeat applications. Approximately 30 hours per month is currently allowed for herbicide treatment across the mine site.

Herbicide application requires trained, competent and qualified personnel to implement the method. Herbicides should only be used as directed by the product label and all safety procedures and warnings detailed in the Material Safety Data Sheet (MSDS) should be adhered throughout any application treatment.

5.5. Pest control methods

NAC undertakes periodic consultation with TRC to keep up to date with pest management issues.

The appropriate control methods for the identified pest species is presented in Table 6, and these methods are outlined in the following sections.

Table 6 Treatment methods for pests

Pest	Baiting	Trapping	Shooting
Common starling	✓	✓	
Cane toad	✓	✓	
Indian myna	✓	✓	
Feral cat	✓	✓	✓
Fox	✓	✓	✓
Black rat	✓	✓	
Brown hare	✓	✓	✓
Mice	✓	✓	
Feral pigs	✓	✓	✓
Rabbit	✓	✓	✓
Wild dog	✓	✓	✓

5.5.1. Integrated pest management

The concept of integrated management involves the use of a variety of control methods, as described in Section 5.4.1.

Integrated pest management will not be commenced without consultation with affected relevant stakeholders, and/or TRC as required by statutory commitments. This will allow for a co-ordinated approach to management of target species to ensure successful management.

5.5.2. Baiting

Baiting for pest species is a cost effective and proven management control. Baiting requires trained and qualified personnel to utilise baits for pest control. Pest baiting requires knowledge of what species are being targeted so that appropriate deployment and bait are utilised. A detractor to use of baits is their potential appeal to non-targeted species.

NAC would participate in baiting campaigns organised through the TRC, and in consultation with relevant stakeholders.

5.5.3. Trapping

Trapping is a common alternative to baiting in areas where baiting poses a high risk to humans, livestock or native wildlife. Trapping for small animals such as rats and mice provides all year management and is very low cost, low labour intensity and no training or qualification are required.

Trapping for the larger animals such as foxes and cats is a method that is best utilised when the objective is to manage low population numbers. This control method requires trained and skilled personnel. Trapping devices are to be inspected daily for success. Pests captured are to be disposed of promptly and humanely.

5.5.4. Shooting

Shooting of pests is occasionally carried out by qualified persons. This control method is only effective for low numbers of pest animals and is currently opportunistic.

6. Records, Monitoring and Review

6.1. Roles and Responsibilities

The roles and responsibilities of the various stakeholders related to the recording, monitoring and review actions of this PWMP is presented in Table 5.

6.2. Records

Both hard and electronic copies of records from all weed and pest control activities are kept in a central location at NAC for a minimum of five years to allow for a comprehensive review of the PWMP. The minimum is recorded for the control events:

- Date;
- Location of activity;
- Target species;
- Method utilised;
- Amount of herbicide/bait utilised;
- Area treated; and
- Numbers/area successfully controlled.

6.3. Monitoring and review

A bi-monthly Environmental Inspection is carried out for the New Acland Mine. Upon commencement of the revised Project, this inspection will expand to cover Project area. Identification of weeds and pest animals are included in the bi-monthly Environmental Inspection, with appropriate actions implemented as required.

An annual monitoring program will continue to be undertaken to determine the current presence of pest and weed species and their abundance within the Study area. Any significant findings, such as new pest or weeds species, new outbreaks or any actions resulting from incidents, from the annual monitoring will be incorporated into an annual review of the PWMP. Weeds and pest identification is also included in the scope of the annual Rehabilitation Monitoring program.

7. References

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Appendix A Declared Plant Fact Sheets

Mother-of-millions

Bryophyllum delagoense (syn. *B. tubiflorum*, *Kalanchoe delagoensis*), *Bryophyllum* × *houghtonii* (syn. *B. daigremontianum* × *B. delagoense*, *Kalanchoe* × *houghtonii*)



Mother-of-millions are escaped ornamental plants originating in Madagascar. Five species are commonly naturalised in Queensland, with one species and a hybrid increasing over substantial areas. It is well adapted to dry areas because of its succulent features.

As the name suggests, one plant can reproduce a new general from masses of embryoids (plantlets) that are formed on the leaf edges. This makes these plants hard to eradicate. Follow up controls are essential.

These plants, especially their flowers, are poisonous to stock and occasionally cause a significant number of cattle deaths. When cattle are under stress or in unusual conditions they are more likely to eat strange plants. Shifting cattle to new paddocks, moving stock through infested rubbish dumps and reduction of availability of feed due to flood or drought can all contribute to poisoning. Since the plant flowers from May to October (during the dryer months of the year) the scarcity of feed may cause cattle to consume lethal amounts of mother-of-millions.

Poisoned cattle show signs of dullness, loss of appetite, diarrhoea and heart failure. Some cattle may drool saliva or dribble urine. There are two responses to poisoning:

1. acute—where cattle die within a day
2. chronic—where cattle may take up to five days to die.

Some cattle may make a slow recovery if insufficient plant material was eaten.

Poisoned cattle must be treated within 24 hours of consuming the plant. The treatment is intense and needs to be given by a veterinarian, or under their direction, because of the drugs and materials used. The treatment is costly—\$70 or more for one adult cow, plus veterinary fees.

Declaration details

Bryophyllum delagoense syn. *B. tubiflorum*, *Kalanchoe delagoensis* and the hybrid *Bryophyllum* × *houghtonii* syn. *B. daigremontianum* × *delagoense*, *Kalanchoe* × *houghtonii* are declared Class 2 plants under the *Land Protection (Pest and Stock Route Management) Act 2002*.



A Class 2 pest is one that has already spread over substantial areas of Queensland, but its impact is so serious that we need to try and control it and avoid further spread onto properties that are still free of the pest. By law, all landholders must try to keep their land free of Class 2 pests and it is an offence to keep or sell these pests without a permit. A local government may serve a notice upon a landholder requiring control of declared pests.

Description and general information

Mother-of-millions are erect, smooth, fleshy succulent plants growing to 1 m or more in height.

All species form tall flower spikes in winter with clusters of bell-shaped flowers. Each species has a distinctive leaf shape, but all produce small plantlets along the edges of the leaves. These plantlets drop readily, develop roots and establish quickly to form a new colony.

Bryophyllum delagoense syn. *B. tubiflorum* and *Kalanchoe delagoensis* (common mother-of-millions, mission bells, Christmas bells) has grey-brown, fleshy, tubular-like leaves with up to seven projections at the tip of each leaf. The flowers are orange-red and occur in a cluster at the top of a single stem. Seeds can germinate for some years.

Bryophyllum × *houghtonii* syn. *B. daigremontianum* × *B. delagoense*, *Kalanchoe* × *houghtonii* (hybrid or crossbred mother-of-millions) has similar flowers arranged in a branched cluster at the top of the stem. Its leaves are boat shaped with thick stalks and notches along the edges of the leaves.

A third species, *Bryophyllum pinnatum* (resurrection plant, live-leaf), is also problematic but is not a declared pest plant. This plant has yellow-green, oval, fleshy leaflets with wavy edges and up to five leaflets per leaf. Its flowers are yellowish-green, often tinged with pink, and occur in loose clusters on stalks growing at intervals along the upper portion of the stem.

Habitat and distribution

These popular garden plants have escaped and spread in various areas of Queensland. They have become a problem in pasture lands in the central highlands around Clermont, Emerald and Dingo, and the Burnett, Moreton and Darling Downs scrub regions. The plants establish well in leaf litter or other debris on shallow soils in shady woodlands, and often grow on roadsides, along fence lines and around old rubbish dumps. They can spread from these areas, especially in flood, and establish if pastures are run down. They are adapted to dry conditions and can survive long periods of drought with crassulacean acid metabolism.

Prevention

The best form of weed control is prevention. Always treat weed infestations when small—do not allow weeds to establish. Weed control is not cheap, but it is cheaper to do it now rather than next year, or the year after. Proper planning ensures you get value for each dollar spent.

Permanent control of mother-of-millions infested areas is best ensured by establishing more desirable plants in that location to compete successfully with future mother-of-millions seedlings and plantlets. This is best achieved through soil preparation, replanting, fertilising and using the area more productively.

Ensure scattered infestations and small dumping areas on properties are regularly checked and cleaned up. Day-to-day hygiene management will help prevent establishment of these weeds.

Co-operative control upstream and downstream of problem areas will help prevent re-infestation from other areas.

To prevent poisoning, keep stock (especially hungry stock) away from infested areas until the plants are controlled.

Control

Look at your weed problem carefully. Should you contain the weed to stop new infestations developing while you reduce existing ones? What are you required to do by legislation? How does weed control fit into your property plan? What can you do to restore and prevent re-establishment?

The best approach is usually to combine different methods. Control may include chemical, mechanical, fire and biological methods combined with land management changes. The control methods you choose should suit the specific weed and your particular situation.

Fire

When suitable (e.g. after grading firebreaks), burn infestations and the accompanying debris on which mother-of-millions plants thrive. This is the most economical form of control, encourages grass competition and lessens the problem for following years, requiring only spot spraying with selective herbicides.

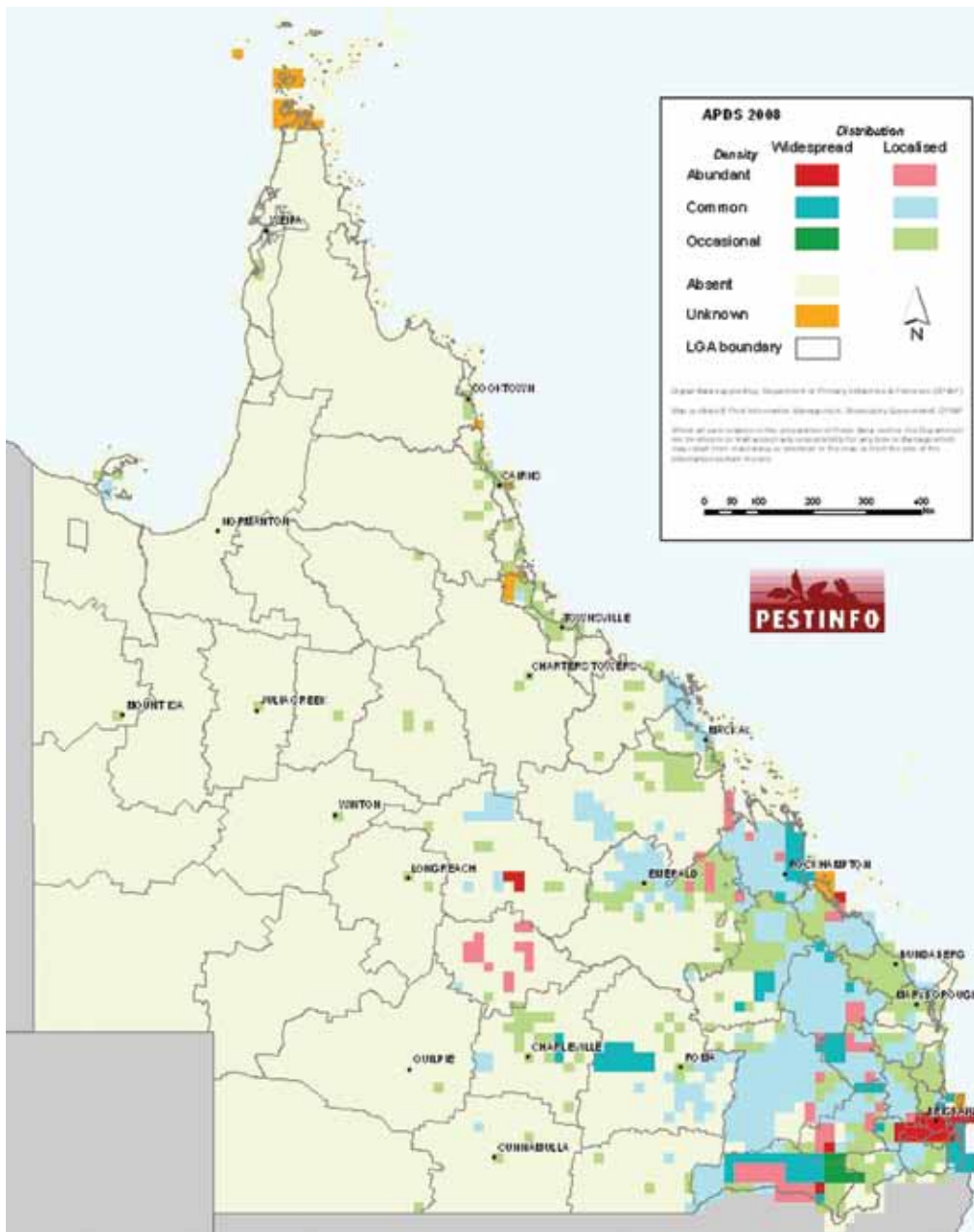


Figure 1. Distribution of mother-of-millions in Queensland

Biological control

The South African citrus thrips is present in Queensland and is quite widespread through the south of the state. This thrips damages the outer tissue of the mother-of-millions plant and also lays its eggs under the outer tissue. Where high populations of thrips exist, the number of viable plantlets and flowers forming on mother-of-millions is reduced.

The thrips populations vary from year to year, according to mother-of-millions populations and climate. The South African citrus thrips should not be seen as a long term control strategy—only a control option to complement other techniques such as herbicide treatment and burning.



South African citrus thrips adult



South African citrus thrips damage to mother-of-millions

Mechanical control

For small areas, pull up plants by hand and burn on a wood heap. Alternatively, bag the plants and dump them in a bin, the contents of which are buried at your councils refuse tip rather than being recycled into mulch.

Herbicide control

Before using any herbicide always read the label carefully. All herbicides must be applied strictly in accordance with the directions on the label. Where the addition of a wetting agent is recommended, always use a commercial wetting agent or surfactant.

Mother-of-millions may be controlled with herbicides at any time of the year, but infestations are easiest to see in winter when the plants are in flower. Treating infestations at this time of year also has the benefit of preventing new seeds from developing on common mother-of-millions.

Table 1 details the herbicides registered for mother-of-millions control.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland (call 13 25 23 or visit our website at www.biosecurity.qld.gov.au).

Table 1. Herbicides registered for the control of mother-of-millions

Situation	Herbicide	Rate	Comments ¹
Pastures, non-crop land	2,4-D acid (AF 300)	7 L/1000 L water per ha	Overall spray handgun
		70 ml/10 L water	Overall spray knapsack
Pastures, rights of way, non-crop land, forests, non-agricultural land, commercial/industrial areas	picloram + triclopyr (e.g. Grass-up, Grazon DS, Picker)	50 ml/10 L water	Overall spray knapsack Apply at flowering
	fluroxypyr	600 ml/100 L water + surfactant	Apply to seedlings and young plants before flowering
	picloram + triclopyr + aminopyralid (e.g. Grazon Extra)	50 ml/10 L water	Add 100% concentrate non-ionic surfactant (e.g. BS 1000) at 100 ml/100 L water Apply at flowering

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

Note:

1. Thorough, even coverage of leaves and plantlets is necessary.

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African boxthorn

Lycium ferocissimum



African boxthorn can be an aggressive invader of pastures, roadsides and reserves. It forms impenetrable, sharp-spined thickets, which can cause problems along fence lines and inhibit the movement of stock. Dense infestations will reduce the usability of pasture land and hinder mustering; they may also provide a haven for rabbits.

Many insects breed in the fruit of African boxthorn, including fruit fly, dried fruit beetle and tomato fly.

The taproot can produce new growth when broken, making it difficult to kill by pulling out. Dead plants can still be a problem to stock and tyres, as plants remain spiky for up to 20 years if not burnt.





Declaration details

African boxthorn is a declared Class 2 plant under the *Land Protection (Pest and Stock Route Management) Act 2002*. Declaration requires landholders to control declared pests on the land and waters under their control. A local government may serve a notice upon a landholder requiring control of declared pests.

It is an offence to introduce, keep or supply Class 2 pests without a permit issued by Biosecurity Queensland. Penalties of up to \$40 000 apply.

Description and general information

African boxthorn is a spiny shrub from South Africa. Introduced to Australia in the mid-1800s as a hedge plant, it has since spread into pastures, neglected areas, roadsides, railways and waterways. It produces a dense thicket armed with spines that can form an impenetrable barrier to domestic stock.

African boxthorn is a perennial shrub up to 5 m in height with a deep and extensive branched root system. The main branches are drooped, widely spreading and carry numerous branchlets, each of which ends in a spine.

The main stem has spines to 15 cm while the branchlets carry smaller spines. Branchlets carry small shoots that have clusters of leaves, surrounded at the base by many small, light brown scales. Initially stems are smooth and light brown but become grey and rough as they mature.

Leaves

Leaves are bright green and rather succulent, 3 cm long and 2 cm wide, rounded at the top and tapering to the base.

Flowers

White to pale mauve flowers about 12 mm in diameter hang from short stalks. They occur singly or in pairs in the forks of the leaves. Smooth green berries ripen to a bright orange to red colour and contain numerous light brown, oval, flattened seeds.

Life cycle

Seeds may germinate at any time of the year and will quickly establish a root system to allow young plants to compete with other species.

Plants are at least two years old when they first bear flowers and although this generally occurs in summer, some flowering and fruiting may occur at all times of the year if sufficient moisture is available.

Habitat and distribution

African boxthorn is a native of southern Africa, occurring mainly in non-coastal areas of south-eastern Queensland. It has been recorded as far afield as Hughenden and Charleville. It is an aggressive weed on some of the better soils of the Maranoa and Darling Downs districts.

The plant will grow on all soil types, although it will establish better in lighter soils, particularly along dry creek beds.

Birds and animals will readily spread African boxthorn by eating the berries and excreting viable seed.

Prevention

Birds and animals spread seeds after they eat the fruit. Prevention therefore depends on controlling the plants before they flower and set fruit.

Control

The best form of weed control is prevention. Weed infestations should be treated when small to prevent large-scale establishment.

The best approach is usually to combine different methods. Control may include chemical and mechanical control methods combined with land management practices. The control methods chosen should suit your particular situation.

Mechanical control

Large stands of boxthorn can be cleared by dozing, stickraking or blade ploughing; however, regrowth from seed or remaining roots will occur. Cultivation and herbicides are effective in dealing with seedlings and regrowth.

Physically removing the plant can be beneficial, as dead boxthorn will still provide a haven for rabbits and occupy valuable pasture areas.

Herbicide control

Before using any herbicide, always read the label carefully. All herbicides must be applied strictly in accordance with the directions on the label. After herbicide application,

African boxthorn plants often lose their leaves and appear dead but may still recover and produce new leaves. This can occur a number of times before the plant is properly dead, especially if a root-absorbed herbicide is used.

Foliar spray

Overall spray the bushes to the point of run-off. Optimum time for spraying is February–May, when plants are actively growing. Do not spray during hot, dry summer periods.

Basal bark treatment

Carefully spray around the base of each stem to a height of 30–40 cm above ground level.

Cut stump treatment

Cut each stem off as close to the ground as possible and **immediately** (within 15 seconds) apply the herbicide mixture liberally to the cut surface.

Root application

Apply one of the residual herbicides to the soil between the base of the plant and the drip line, preferably when the soil is wet or rain is expected.

Note: Native trees are very susceptible to these residual herbicides, and they should not be used within a distance of twice the height of adjacent desirable trees.

Further information

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Table 1 Some of the herbicides registered for the control of African boxthorn. Other herbicides may be registered for use in other situations

Situation	Herbicide active ingredient	Rate	Comments
Pastures, rights of way and non-crop land	glyphosate as ipa (360 g/L)	0.7–1 L/100 L	Non-selective herbicide High-volume foliar spray to point of run-off using power spray or knapsack. Use lower rates for young bushes
	glyphosate as K salt (500 g/L) (e.g. Touchdown [®] Hitech)	0.6 L/100 L	Non-selective herbicide High-volume foliar spray to point of run-off using power spray or knapsack. Re-treatment and/or subsequent control of seedlings may be required
	triclopyr as butotyl (300 g/L) + picloram as hopa (100 g/L) (e.g. Grazon Extra [®])	0.5 L/100 L	High-volume foliar spray to point of run-off using power spray or knapsack. For use on plants less than 2 m tall. Apply when bushes have good leaf cover and are actively growing
	2,4-D as tipa (300 g/L) + picloram as tipa (75 g/L) (e.g. Tordon 75-D [®])	1.3 L/100 L	Treat small plants only. High volume foliar spray to point of run-off using power spray or knapsack. Optimum time to spray is prior to bud burst. Spray soil to drip line
	triclopyr as butotyl (240 g/L) + picloram as ioe (120 g/L) (e.g. Access [®])	1 L/60 L diesel	Basal bark stems up to 5 cm thick. Spray bark to 30 cm above ground level Cut stump treatment for larger plants. Cut plant as close to ground as possible and apply herbicide mixture immediately (within 15 seconds) after cut is made

Table 1 (Continued)

Situation	Herbicide active ingredient	Rate	Comments
Pastures, rights of way and non-crop land	triclopyr as butotyl (600 g/L) (e.g. Garlon® 600)	1 L/30 L diesel	Basal bark stems up to 5 cm thick. Spray bark to 30 cm above ground level Cut stump treatment for larger plants. Cut plant as close to ground as possible and apply herbicide mixture immediately (within 15 seconds) after cut is made
Pastures, around agricultural buildings	hexazinone (250 g/L) ¹ (e.g. Velpar®L)	1–4 ml/spot	Residual for root application. Do not use within a distance of twice the height of desirable trees. Use 1 spot for each metre in height for bushes up to 3 m tall
Pastures	tebuthiuron (200 g/kg) ¹ (e.g. Graslan®)	2 gm/m ²	Residual for root application. Do not use within a distance of twice the height of desirable trees Refer to label for critical comments
Pastures, rights of way	Picloram as tea (20 g/kg) (e.g. Tordon Granules®)	35–45 gm/m ²	Residual for root application. Do not apply when plant may be stressed (not actively growing). Do not use within a distance of twice the height of desirable trees

Notes:

¹Recording of herbicide usage is required on grazing properties over 2000 ha in Great Barrier Reef catchments.

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

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