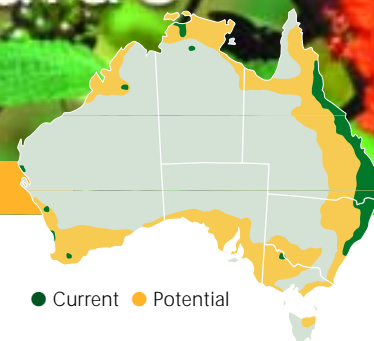


Weed Management Guide

Lantana – *Lantana camara*



Lantana (*Lantana camara*)

The problem

Lantana is a *Weed of National Significance*. It is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts.

Lantana forms dense, impenetrable thickets that take over native bushland and pastures on the east coast of Australia. It competes for resources with, and reduces the productivity of, pastures and forestry plantations. It adds fuel to fires, and is toxic to stock.

Lantana is a serious threat to biodiversity in several World Heritage-listed areas including the Wet Tropics of northern Queensland, Fraser Island and the Greater Blue Mountains. Numerous plant and animal species of conservation significance are threatened. It is listed as the most significant environmental weed by the South-East Queensland Environmental Weeds Management Group.

It is a problem in gardens because it can cross-pollinate with weedy varieties to create new, more resilient forms.

The weed

There are two main forms of lantana in Australia: a cultivated form planted in gardens and a weedy variety found in bushland and pastures. The cultivated form of lantana is non-thorny, produces few seeds and is compact in shape. The weedy form is a prolific seeder with straggly, thorny stems. Both forms include



Lantana is a significant weed of woodlands and pastures east of the Great Dividing Range. Photo: Qld DNRM

many varieties, which differ from each other in shape, flower colour, prickliness, response to enemies and toxicity.

Weedy lantana is a much branched, thicket-forming shrub, 2–4 m tall. The woody stems are square in cross-section and hairy when young but become cylindrical and up to 150 mm thick with age. The ovate (ie tear-shaped) leaves (20–100 mm long) occur in opposing pairs along the stem. The leaves are rough and finely hairy and emit a pungent odour when crushed. Each flower head is made up of 20–40 flowers, ranging in colour from white, cream or yellow to orange, pink, purple and red. The fruit has many berries, which ripen from green to shiny purple-black and contain a single pale seed. Lantana has a short taproot and a mat of many shallow side roots.

Key points

- Lantana is a thicket-forming shrub that has spread from gardens into pastures, woodlands and rainforests on the east coast.
- It typically invades disturbed land and river margins, extending its range in response to rainfall.
- It threatens agriculture and pastoral production, forestry and biodiversity of conservation areas, and may be toxic to stock.
- The highest priority for lantana control is preventing its spread into northern Australia and west of the Great Dividing Range.
- Integrated control should combine fire, mechanical, chemical and biological methods, and revegetation.



Growth calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering	■	■	■	■	■	■	■	■	■	■	■	■
Seed formation	■	■	■	■	■	■	■	■	■	■	■	■
Seed drop	■	■	■	■	■	■	■	■	■	■	■	■
Germination	■	■	■	■	■	■	■	■	■	■	■	■

■ General growth pattern ■ Growth pattern in very wet years

Lantana flowers whenever the soil is moist and the air is warm and humid. For much of its range along the Queensland and New South Wales coasts, this results in almost continuous flowering and fruiting. Further inland, peak flowering occurs several weeks after soaking rain (25 mm or more) and is usually accompanied by good fruit set.

Germination most frequently occurs following the first summer storms, but may occur at any time of the year when sufficient moisture is present. Initial seedling growth is slow until the roots become established, after which close stems intertwine and begin to form thickets. Flowering does not usually commence until early in the following summer and then continues until March or April.

Lantana can resprout from the base if the shoot dies, extending the life of individual plants.

How it spreads

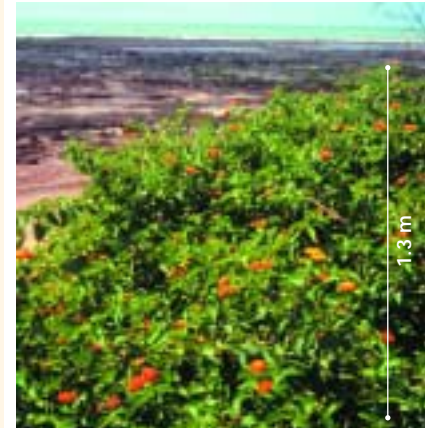
Lantana spreads in two ways. Layering is a form of vegetative reproduction where stems send roots into the soil, allowing it to quickly form very dense stands and spread short distances. Also, birds and other animals such as foxes consume and pass the seed in their droppings, potentially spreading it over quite large distances. The germination rate of fresh seed is generally low, but improves after being digested.

Butterflies, bees and other insects are attracted by the nectar and pollinate lantana flowers. About half of the flowers

produce seeds, typically 1–20 seeds on each flower head. Mature plants can produce up to 12,000 seeds every year. Seeds are thought to remain viable for several years under natural conditions.

Lantana is allelopathic and can release chemicals into the surrounding soil which prevent germination and competition from some other plant species.

First recorded in the Adelaide Botanic Gardens in 1841, lantana spread to east coast gardens and was recorded as a weed in Brisbane and Sydney in the early 1860s. It is now found across four million hectares of land east of the Great



Flowering lantana infestation in Darwin, NT, in December.
Photo: Colin G. Wilson

Dividing Range, from Mount Dromedary in southern New South Wales to Cape Melville in northern Queensland. Isolated infestations exist in the Top End of the Northern Territory, around Perth in Western Australia, and on Lord Howe and Norfolk Islands. Although present Australia wide as a garden ornamental, it has not naturalised to any serious extent elsewhere.

Where it grows

Lantana can grow in high-rainfall areas with tropical, subtropical and temperate climates. It does not tolerate salty or dry soils, waterlogging or low temperatures (<5°C). It thrives on rich, organic soils but also grows on well-drained clay and basalt soils. Sandy soils tend to dry out too rapidly for lantana unless soil moisture is continually replenished. It has been reported at altitudes up to 1000 m in Queensland.

Lantana invades disturbed sites, especially open sunny areas, such as roadsides, cultivated pastures and fencelines. From there it can invade the edges of forests, but it does not fare as well under a heavy canopy as it is not very shade tolerant. Therefore, it is not a problem in intact tropical rainforest but can quickly spread there if the canopy opens out.

Lantana occurs naturally in Mexico, the Caribbean and tropical and subtropical Central and South America. It is considered a weed in nearly 50 countries.



When ripe, birds and animals consume fruit and spread seed.
Photo: Colin G. Wilson

Another weedy species of lantana

Another species of lantana is a popular ornamental that is considered a weed when present in natural ecosystems. Creeping lantana (*Lantana montevidensis*) occurs in coastal and subcoastal Queensland and as far south as Sydney. It is fairly similar to *Lantana camara* but does not have thorns, has mainly pink or purple flowers and trails along the ground, only growing to a height of half a metre. It is also toxic and readily displaces native vegetation.



Creeping lantana (*Lantana montevidensis*) is naturalised in coastal and subcoastal Qld and only grows to a height of half a metre. It is toxic and readily displaces native vegetation. Photo: John Swarbrick

Potential distribution

Lantana may be able to spread west of the Great Dividing Range, and could expand its range throughout southern Victoria, South Australia and southwestern Western Australia.

What to do about it

Lantana is extremely widespread and abundant. Because it is so well established on the east coast, and prevention of spread is the most cost-effective weed management tool, the highest priority for lantana management is to prevent its spread into uninfested areas. This will require three main actions.

1. Restricting further importation of lantana into Australia. Any new varieties brought in could escape cultivation and naturalise, or could cross-breed with naturalised varieties, leading to

hardier new varieties more resistant to control.

2. Restricting the sale and use of lantana in gardens as these are potential sources of new infestation and new varieties. There are native and less weedy exotic ornamental alternative species.
3. Strategically controlling infestations that threaten areas where lantana is not yet a weed. Control methods are outlined below.

Integrated management

An integrated approach that uses a variety of control methods gives best results when dealing with lantana. A range of methods including herbicides, mechanical removal, fire, biological control and revegetation should be used. Best results are obtained by working from areas of light infestation towards heavier infestation, and long-term follow-up control is required after

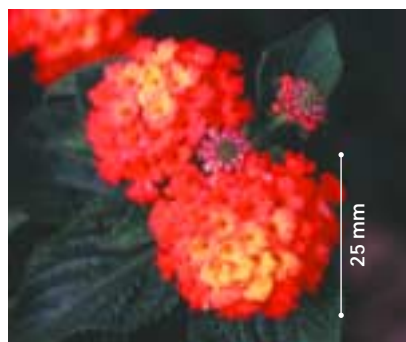
initial attempts. Minimise both disturbance to land and excessive use of fire to retain vigorous native vegetation and reduce the opportunity for lantana to become established.

Herbicide control – effective but expensive

There are many herbicides registered for lantana control and three main application techniques. Spraying the entire plant (foliar spraying) usually kills plants that are less than 2 m high. Herbicides applied to the lower bark of the stems (the basal bark technique) or immediately painted onto a freshly cut stump (the cut-stump technique) are useful for larger plants. Both of these techniques are time consuming because they require treatment of each stem, which can be difficult to access in large stands of lantana. High costs make herbicide control uneconomical for large infestations, except when there are no other options (eg on steep slopes, where helicopter spraying may be required).

For best results, integrate fire, mechanical, chemical and biological control and revegetation

Herbicides, especially those that are foliar applied, are most effective when plants are actively growing. With lantana, best results are obtained six weeks after good rains (at least 35 mm) when minimum temperatures exceed 15°C. In Queensland the spraying season generally lasts from early summer to autumn, but earlier control will potentially allow follow-up in the same growing season.



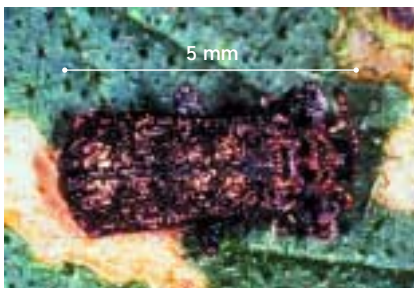
Lantana flowers can be one colour (*left*), or a mix of two (*centre*) or more colours (*right*). Photos: Colin G. Wilson

Weed control contacts

State / Territory	Department	Phone	Email	Website
ACT	Environment ACT	(02) 6207 9777	EnvironmentACT@act.gov.au	www.environment.act.gov.au
NSW	NSW Agriculture	1800 680 244	weeds@agric.nsw.gov.au	www.agric.nsw.gov.au
NT	Dept of Infrastructure, Planning and Environment	(08) 8999 5511	weedinfo.ipe@nt.gov.au	www.nt.gov.au
Qld	Dept of Natural Resources and Mines	(07) 3896 3111	enquiries@nrm.qld.gov.au	www.nrm.qld.gov.au
SA	Dept of Water, Land and Biodiversity Conservation	(08) 8303 9500	apc@saugov.sa.gov.au	www.dwlbc.sa.gov.au
Tas	Dept of Primary Industries, Water and Environment	1300 368 550	Weeds.Enquiries@dpiwe.tas.gov.au	www.dpiwe.gov.au
Vic	Dept of Primary Industries/Dept of Sustainability and Environment	136 186	customer.service@dpi.vic.gov.au	www.dpi.vic.gov.au www.dse.vic.gov.au
WA	Dept of Agriculture	(08) 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au
Australia wide	Australian Pesticides and Veterinary Medicines Authority	(02) 6272 5852	contact@apvma.gov.au	www.apvma.gov.au

Note that herbicides vary in their effectiveness on different lantana varieties. The red flowered varieties are normally the least susceptible to herbicides while the pink forms are the easiest controlled. Consult your local council or state/territory weed management agency about which herbicides and applications are most suitable for your infestation of lantana. State and territory contact details are listed above, including contacts for the Australian Pesticides and Veterinary Medicines Authority, which hosts the PUBCRIS database. This database contains information on all herbicides that are registered for use on weeds in each Australian state and territory.

When using herbicides always read the label and follow instructions carefully. Particular care should be taken when using herbicides near waterways because rainfall running off the land into waterways can carry herbicides with it. Permits from state or territory Environment Protection Authorities may be required if herbicides are to be sprayed on riverbanks.



Both adults (*above*) and larvae of the leaf-mining beetle *Octotoma scabripennis* feed on lantana leaves. It is present in most lantana infestations, particularly where it is shady and wet in subtropical, coastal areas.
Photo: Michael Day, Qld DNRM



Damage to lantana leaves caused by the leaf-mining beetle *Octotoma scabripennis*.
Photo: Michael Day, Qld DNRM

Mechanical and physical control – suitable for small infestations

Lantana can be removed mechanically or physically in several ways, including stickraking, bulldozing, ploughing and grubbing. These techniques are mainly suited to medium-sized infestations and require extensive follow-up, as they invariably lead to regrowth if the rootstock is not removed, or seedling germination when heavy machinery disturbs the soil. Any soil disturbance should be avoided on steep inclines or in gullies. A permit

may be required if native plants are to be affected by mechanical control – check with your local council or state/territory weed management agency.

Fire – inexpensive but caution must be exercised

Fire is often used prior to mechanical or herbicide control to improve their effectiveness, or as a follow-up to such methods. It can also provide some control when used on its own under the right conditions. It is most effective when fires are hot and the lantana is actively

growing. In southeastern Queensland best results from fire are achieved during early summer. In New South Wales controlled burns are used opportunistically, mainly in late winter and spring before conditions become too dry and fires could escape control.

Fire is relatively inexpensive and well suited to dense infestations, but the risks to people and property must be carefully managed. Burning is not recommended in rainforest and vine thickets because they are highly sensitive to fire. Disturbance in these habitats may actually promote lantana if the canopy is opened up. A permit may be required to burn – check with your local council or state/territory weed management agency.

Biological control

In 1902 the first attempt at biological control of a weed targeted lantana in Hawaii. In Australia biological control agents were first introduced in 1914; so far, 30 species have been introduced. Research into biological control is ongoing, and several agents are currently being examined for suitability of release.



Of the 16 species that have established, four insects have had a major impact on lantana. They are:

- a sap-sucking bug (*Teleonemia scrupulosa*) (Sydney to northern Queensland).
- a leaf-mining beetle (*Uroplata girardi*) (northern Queensland to Sydney).
- a leaf-mining beetle (*Ocotoma scabripennis*) (Sydney to south of Rockhampton).
- a seed-feeding fly (*Ophiomyia lantanae*) (southern New South Wales to northern Queensland).

The biological control agents vary in their effectiveness against the many different types of lantana. For example, lantana can drop its leaves when stressed, depriving some agents of their food.

Revegetation – useful in pastures and forests

Revegetation of a treated site is a key component of a lantana management program. Revegetation helps to reduce

erosion, adds fuel for future burning in pastures and is vital in limiting the re-establishment of lantana and other weeds. Sowing an improved pasture that outcompetes and smothers lantana seedlings is assisted by withholding grazing for the first six months, and only allowing light grazing for the next 12–18 months. In forested areas either planting trees or encouraging naturally occurring seedlings will help to shade out lantana in the longer term. Check with your local council or state/territory weed management agency about appropriate species for revegetating pastures or forests in your area.

Follow-up

Follow-up control after an initial effort may include any or all of the above methods. Established pastures can be burnt to control significant lantana regrowth, and any small patches can be spot sprayed with a registered herbicide or grubbed out. In forested areas herbicides are recommended to control regrowth,

typically requiring three follow-up sprays after the initial control effort.

Legislation

Landholders are required to reduce lantana infestations throughout some regions of Queensland, New South Wales and the Northern Territory. The sale of lantana in Queensland was banned in late 2003. Lantana importation is prohibited in Western Australia. Check with your local council or state/territory weed management agency for relevant details.

Acknowledgments

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Maps: Australian Weeds Committee.

...case study

Lantana control at Towra Point, Botany Bay, New South Wales

Towra Point Nature Reserve in Botany Bay contains habitats of high conservation status, including wetlands of international importance and open woodlands that are unique in the Sydney region. A coastal rainforest in the region was recently listed as an endangered ecological community under the New South Wales *Threatened Species Conservation Act 1995*. It includes the magenta brush cherry (*Syzygium paniculatum*), a vulnerable tree species.

By the 1990s, lantana made up almost 75% of the vegetation cover in some parts of the reserve and was limiting the regeneration of native species, particularly around a freshwater wetland called Weedy Pond. The Friends of Towra, a volunteer group, commenced weed control in the Weedy Pond rainforest in 1996. In 1998 the Sutherland Shire Environment Centre, working in conjunction with the National Parks and Wildlife Service, gained

Coastcare funding to supplement the volunteer program.

Beginning in March 1998, weed control focused on a corridor connecting the rainforest and a casuarina/banksia forest, following up on previous control and initiating new efforts. Lantana was controlled by a combination of cut-stump herbicide application and manual removal of smaller plants. Other weeds were also controlled when they were encountered.

Work was undertaken about every two months throughout 1998 by volunteers and members of local community groups. Follow-up hand weeding and spot spraying, and further control of primary lantana infestations, were also undertaken throughout 1999. This work involved international backpackers, unemployed people from Green Corps 2000, students and personnel from private enterprise, all of whom volunteered their time. The total

area cleared of lantana and other weeds was approximately 75 m wide and 100 m long.

In May 2000 the cleared areas were planted with native vegetation by local Cub Scouts and Venturers and members of the Friends of Towra. Approximately 200 banksias were planted. The training of volunteers and community groups on such issues as weed control techniques, bush regeneration and plant identification was another significant outcome.

At each quarterly follow-up visit to the site, approximately 24 man-hours are required to keep on top of any reshooting and newly germinated lantana, and encourage regeneration of native species. It is expected that lantana will become disadvantaged as canopy cover and shade increases, and less work will be required in the future.



How to control lantana

Quick reference guide

Minimise spread and future impacts

Although lantana is widespread on the east coast of Australia, it is still absent from parts of its potential range. These areas should be protected by:

- preventing the importation of further varieties and species of lantana
- stopping more planting of lantana in gardens
- strategically controlling infestations which threaten uninfested areas.

A control program for dense infestations in pastures

The Queensland Department of Natural Resources and Mines has produced a pest series fact sheet on lantana (PP#34). They advise that herbicides are too expensive to treat large lantana infestations.

A combination of fire and mechanical control makes spot treatment of small patches with herbicides more cost-effective. The following suggested control program for dense infestations in pastures is based on the fact sheet:

1. Exclude stock to allow a fuel load to build up.
2. Bulldoze, stickrake or plough the infestation to add to the fuel load.
3. Burn the infestation after obtaining a permit. Summer burns are more effective than winter burns.
4. Sow an improved pasture. Seek advice of local council or state/territory government agencies for selection of non-weedy pasture species.
5. Continue stock exclusion until pasture has established and set seed.
6. Burn the infestation again after obtaining a permit.

7. Spot spray or grub out any regrowth or seedlings. Spraying is most effective between summer and autumn.

8. Follow-up burning, spraying and/or grubbing will be required for several years.



Lantana can escape from garden plantings into surrounding bushland.

Photo: Tim Schultz

Control options

Type of infestation	Physical	Mechanical	Chemical	Fire	Biological
Small (few plants, small area)	Hand grubbing only suitable for seedlings.	Not suitable.	Spot spray plants less than 2 m in height between summer and autumn with a registered herbicide.	Not suitable.	There are four useful biological control agents. They are already distributed throughout their potential range.
Medium (medium density, medium total area)	Wear gloves for protection from thorns.	Bulldoze, plough, stick-rake or slash infestations. Soil disturbance will lead to mass seed germination, so follow up with further controls. Do not use mechanical control in areas susceptible to erosion. A permit may be required.	Spraying is uneconomical for medium or large infestations. Helicopter spraying is used when there is no access for mechanical control, eg very steep slopes.	Under permit, burn in summer with good fuel load of grass and/or mechanically cleared lantana. Also use as follow-up. Do not burn in rainforests.	
Large (many plants, many ha)					

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