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Lantana: a Weed of National Significance



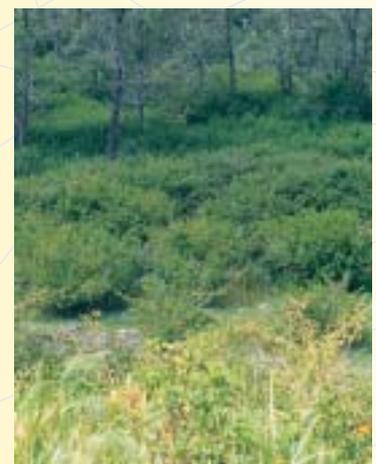
Mick Richards

Lantana invades disturbed rainforest, Springbrook National Park, Qld.



Mike Day

Dense thickets exclude native species, Copmanhurst, NSW.



Mike Day

Lantana in woodland pasture, Cangai, NSW.

Lantana: a Weed of National Significance

Lantana (*Lantana camara*) originates from tropical and subtropical America. It is now a major weed pest in over 60 countries, and is considered to be one of the 10 worst weeds worldwide.

Lantana is one of Australia's most debilitating invasive weeds. It is recognised as a Weed of National Significance because of its impacts on primary industries, conservation and biodiversity, and the extent of its distribution. Since its introduction to Australia as an ornamental plant in the 1840s, it has infested more than four million hectares of eastern Australia from Victoria to northern Queensland, and has also spread into the Northern Territory and Western Australia.

Without a concerted effort, it will continue to infest new areas of natural ecosystems and productive land. Preventing any further spread in Australia is a very high priority.

Who is affected by lantana?

The impacts of lantana infestations range widely across land-use situations, affecting individuals, landholders and land managers, local, state and federal governments, community groups, and industry.

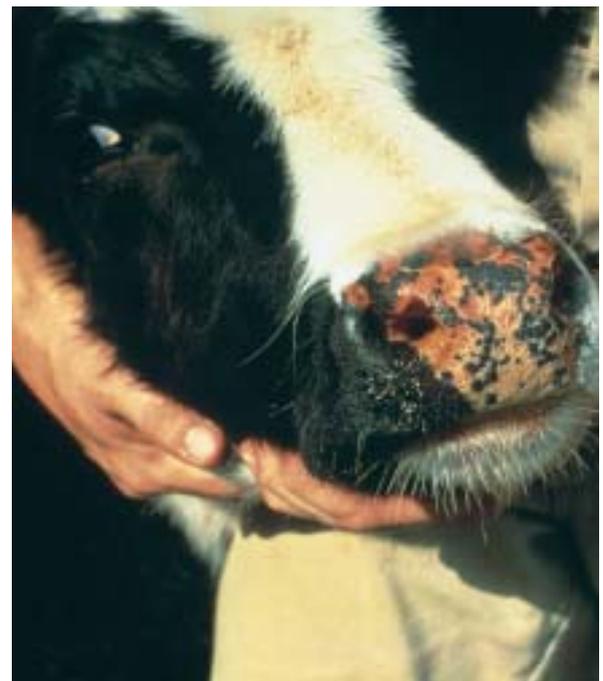
In natural ecosystems, lantana infests forest edges, coastal zones and riparian areas, penetrates disturbed rainforest and invades open eucalypt woodland. Its dense thickets exclude native species through smothering and allelopathic effects (i.e. toxicity to other plants), dominate understoreys, and reduce biodiversity. Lantana thickets increase the intensity of wildfires, which can have disastrous effects on native flora and fauna.

Lantana is present in all rainforest remnants on the north coast of New South Wales, making it the most widespread rainforest weed in the bioregion. Lantana is also a major threat to rainforest remnants in south-east Queensland and the Wet Tropics World Heritage Area, particularly along forest edges where it increases the damage from wildfires, spoils scenery, and has an adverse effect on recreation.

In agricultural situations, lantana invades pastures and grazing lands, riparian areas, cultivated land and orchards, increasing the costs of production, impeding access for vehicles, machinery and stock, and reducing property values. It is also toxic to livestock. Annual pastoral losses in Queensland in 1985 were estimated to be \$7.7 million, as a result of 1500 animal deaths, reductions in productivity, loss of pasture and control costs.

In commercial forestry, lantana raises production costs, increases the risk of damage by fire, impedes access and reduces amenity values.

Lantana also infests roadsides, railway reserves, utility easements and unused state lands, restricting access and imposing control costs.



Lantana is toxic to livestock.

Ross McKenzie, courtesy of DPI&F, Qld.



Mick Richards

Lantana provides substitute habitat.



Mick Richards

Public planting of ornamental lantana, Fortitude Valley, QLD.



Mike Day

Lantana can provide a buffer along forest edges, Farleigh, QLD.



Mick Richards

Ornamental lantana is still sold in some states.

Perceived benefits of lantana

As habitat

Lantana thickets can provide a substitute habitat for birds and animals, such as bandicoots, whipbirds, quail, wrens, birdwing butterflies, and brush turkeys where they have replaced the natural understorey vegetation.

As a buffer

In some disturbed rainforest areas, lantana prevents invasion by grass and other weeds, and it can form a useful temporary buffer along forest edges for bush regeneration projects.

In farm management

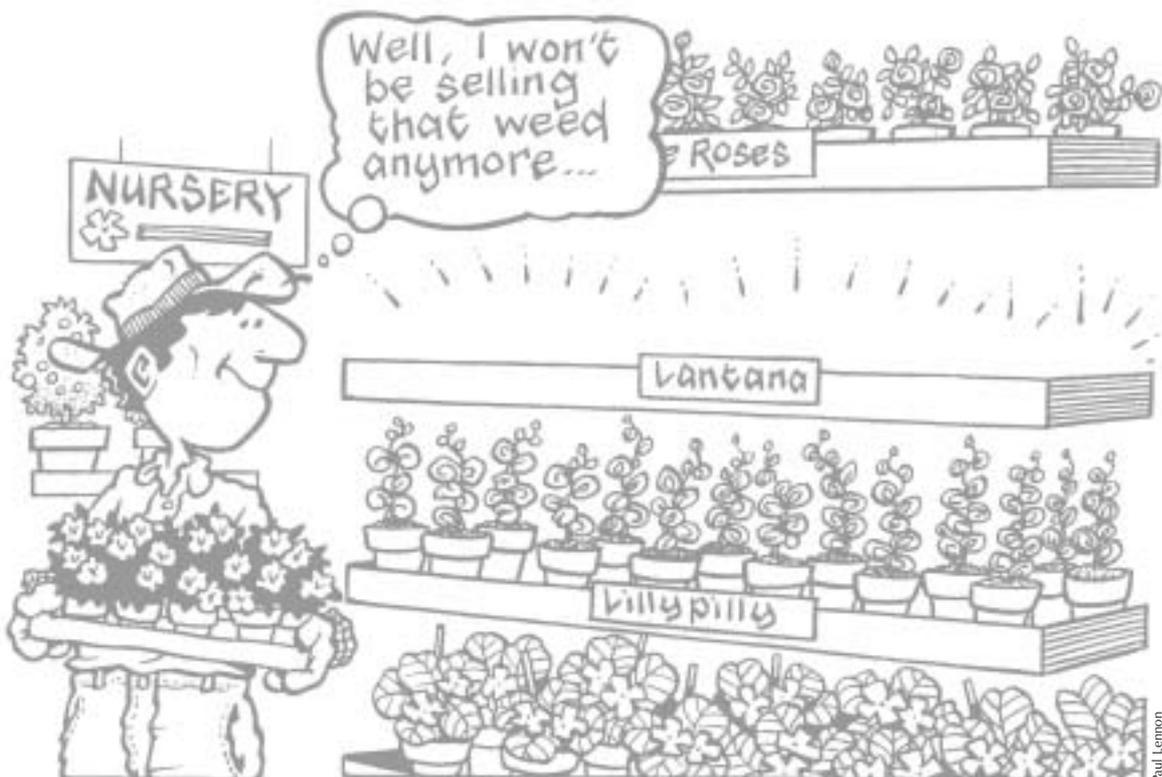
In some agricultural contexts, infestations of lantana are seen to prevent soil compaction, and are valued as a source of

organic matter for pasture renovation or improvement.

The weed is also considered to be useful in steep areas and stream banks for stabilising soil and preventing erosion. In some cases, it suppresses weeds perceived to be worse.

As a source of income

The sale of ornamental lantana in some states provides income for the nursery industry. Valued for being colourful and requiring little maintenance, ornamental lantana is still being used extensively in landscape design, and in public and private gardens. This is now changing in some states. (For further information, see the section 'Declarations in each state and territory').



Paul Lennon



Commercial breeding adds to the problem.

Real costs of lantana

Any benefits of lantana are far outweighed by its negative effects:

Lantana threatens habitat

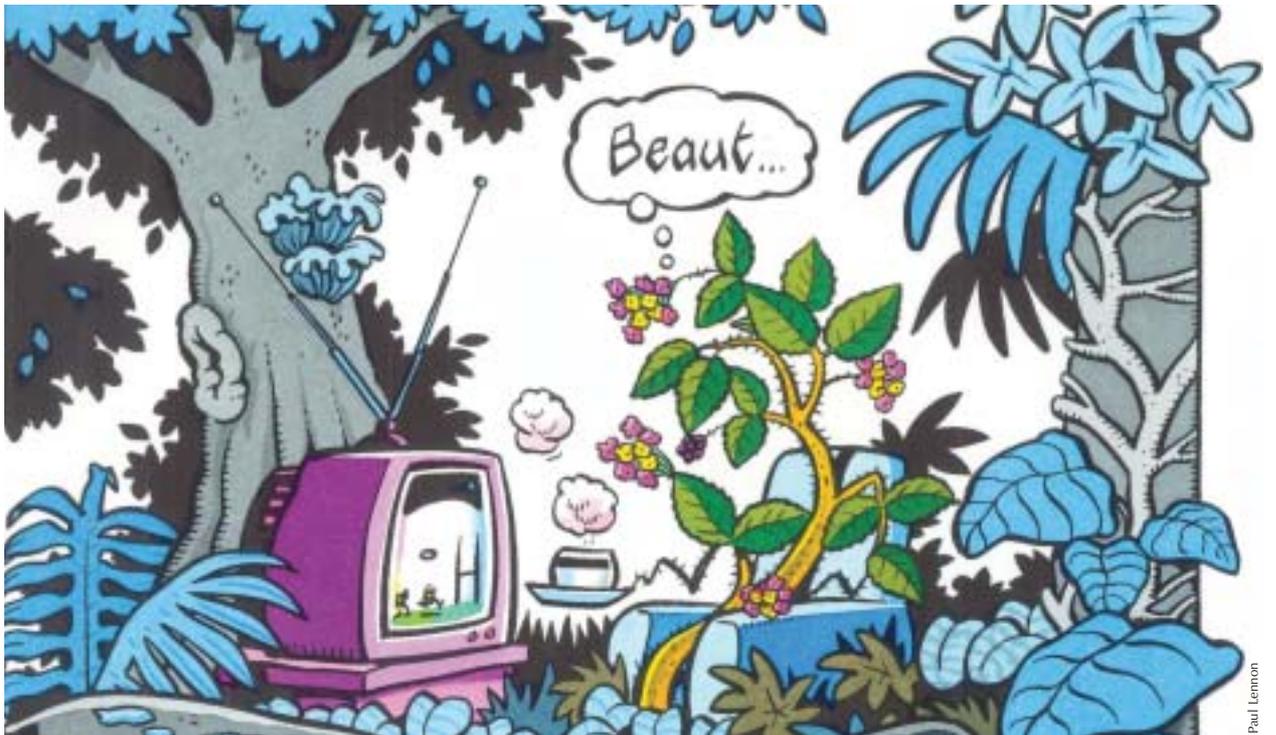
While it does provide substitute habitat in some situations, it also threatens natural habitat and native flora and fauna. On the upper north coast of New South Wales (from Coffs Harbour north to the Queensland border, and west to the escarpment of the New England Tableland), the native fauna and flora are among the most diverse in Australia. Studies have shown that one entire ecological community (lowland rainforest on floodplains) and nineteen endangered or threatened flora species in this area are under threat specifically from lantana.

Lantana is an economic burden

The total cost of controlling lantana in natural ecosystems and agricultural contexts in Australia far outweighs its limited benefits. The current cost of lost production in Australia due to lantana has been conservatively estimated at more than \$22 million per annum.

Lantana is a worsening weed

The commercial breeding of new forms of ornamental lantana ultimately adds genetic diversity to the weedy forms, potentially decreasing the effectiveness of controls.



Lantana may have made itself at home in Australia, but we need to change the idea that it is an acceptable part of the landscape, or a low-priority weed. Now is the time for landholders, governments, community and industry to rebuild commitment to lantana management and control.

Description



Mike Day

Lantana growing in clumps, Ma Ma Creek, QLD.



Mike Day

Dense thickets of lantana, Mt Sylvia, QLD.



Andrew Clark

Lantana is able to climb with support, Lake Karangi, NSW.



Andrew Clark

Heavily branched, arching stems, Pelaw Main, NSW.



Colin Wilson, courtesy of DPIE NT.

Clusters of green fruit ripen to shiny black.



Mick Richards

Shallow mat-like root system.

Description

Lantana is a heavily branching shrub, which grows in dense thickets or clumps 2–4 m high and is able to climb to 15 m with the support of other vegetation.

Lantana camara—a species complex

The weed known as *Lantana camara* in Australia is a highly variable hybrid plant probably originating from two or more lantana species from tropical America. The Latin name *Lantana camara* refers in the strict sense to one Caribbean species, but in Australia, as in other countries, the name *Lantana camara* is used mostly as a convenient reference for the highly variable weedy species complex. The weedy lantana species complex consists of around 600 wild, cultivated, and hybridised varieties present in over 60 countries. At least 29 varieties (indicated by flower colour, structure of leaf hairs, thorniness, and length of bracts) are reportedly present in Australia, and have been divided into five main types identified by flower colour: pink, red, orange, white, and pink-edged red (see below).

Physical characteristics

- Lantana has arching stems that are square in cross-section, with pithy centres and short, backwardly hooked prickles. Aged stems can be up to 15 cm in diameter.
- The leaves are 2–10 cm long with toothed edges, bright green on the upper surface and paler green, hairy and strongly veined on the underside. They grow opposite one another along the stems, and their size and shape depends on the type of lantana, and the availability of moisture.
- The plant has a shallow root system made up of a short taproot with lateral roots branching out to form a mat.
- The inflorescences (clusters of 20–40 individual flowers) are about 2.5 cm in diameter. Tightly packed, angular flower buds open from the outside towards the centre of the inflorescence as they mature.
- Single-seeded hard green fruit grow in clusters, are about 5–7 mm in diameter and ripen to shiny black or purple fleshy berries.
- Crushing the stems and leaves produces a strong characteristic smell.

Habitat

- Lantana grows in a variety of coastal and subcoastal areas, thriving in high rainfall areas of tropical, subtropical and warm temperate climates. The upper temperature limit for growth is not known; however new shoots are frost-sensitive and growth is prevented below 5° C.
- It prefers conditions where soil moisture is available throughout the year, but can survive prolonged dry periods. It does not tolerate waterlogging or salinity.
- It grows well in rich organic soils, well-drained clay soils, and volcanic soils derived from basalts but will also tolerate poor soils and almost pure sands, as long as moisture is available.
- It will not grow in the tropics if soils are shallow and have a very limited water-holding capacity.
- It will tolerate partial, but not complete, shading.



Hellen Haapakoski



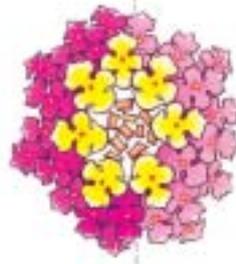
Emily Menzies

Leaf size and shape can vary.

Colour types of weedy *Lantana camara*

Identification of lantana types by flower colour can be difficult, as the colours of the inner buds as well as the inner and outer flowers must be considered. The five main colour types are known as pink, white, pink-edged red, red, and orange.

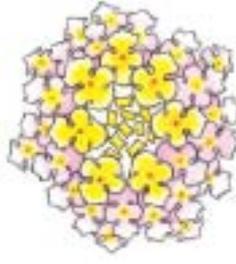
Jeff Wright



Pink *Lantana camara*

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

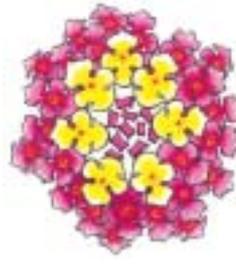
Jeff Wright



White *Lantana camara*

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

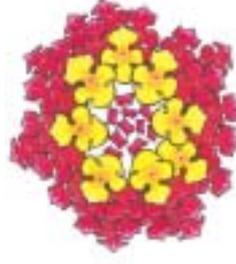
Mick Richards



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)

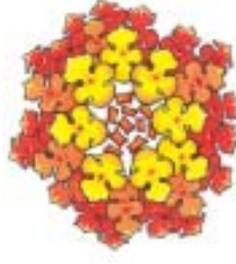
Mike Day



Red *Lantana camara*

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

Mick Richards



Orange *Lantana camara*

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

Leaf variation in the five colour types

Variations in leaf colour, size and texture can generally be associated with the different lantana colour types:

pink lantana—large, pale green leaves with a velvety texture

white lantana—small, tough leaves, less velvety than those of pink lantana

pink-edged red lantana—small, tough leaves, darker than those of pink lantana, and less velvety

red lantana—large, dark green leaves with a velvety texture

orange lantana—small, tough leaves that are rough and hairy

Lantana montevidensis (creeping lantana)

Purple or lilac flowers with white or yellow centres generally indicate another weedy species, *Lantana montevidensis*, or creeping lantana. *L. montevidensis* is a scrambling low woody shrub which is invasive in coastal and subcoastal areas.

It features:

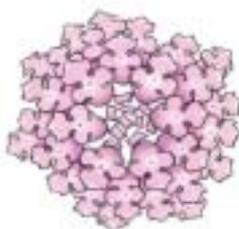
- stems that are square in cross-section, and without prickles
- leaves up to 3 cm long
- short, profusely flowering branches that form mats.

This manual deals only with *L. camara*. Information about *L. montevidensis* is provided here to help identify the two species.

Andrew Clark



Lilac *Lantana montevidensis* (creeping lantana)



Bud: lilac



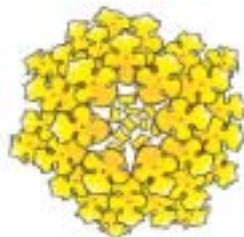
Middle and outer ring: white throat, lilac to mauve petals

Ornamental lantana

Both *L. camara* and *L. montevidensis* have been developed as ornamentals in Australia. They are available in a similar range of flower colours (lilac, pink, red, orange, yellow, and white—some of which are illustrated below) to the weedy varieties, making it difficult to distinguish between them; however, the ornamental varieties of both species are generally smaller, more compact plants with smaller leaves.

The ornamental yellow *L. camara* hybrid and the lilac and white ornamental *L. montevidensis* varieties are commonly seen in public places and gardens.

Mick Richards



Ornamental Yellow *Lantana* spp.

Ornamental varieties come in a range of other flower colours.

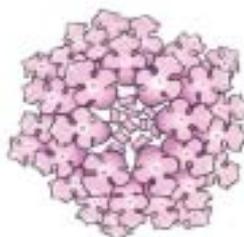


Bud: greenish yellow



Middle and outer ring: ochre yellow throat and petals

Mick Richards



Ornamental Lilac *Lantana montevidensis*

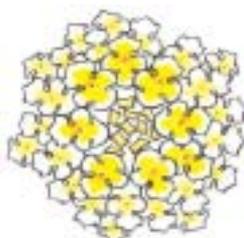


Bud: lilac



Middle and outer ring: white to yellow throat, lilac to mauve petals

Mick Richards



Ornamental White *Lantana montevidensis*



Bud: white to cream



Middle ring: yellow throat, white petals



Outer ring: pale yellow throat, white petals

Reproduction and spread



White lantana seeds in emu droppings.



Horizontal stems can take root in moist soil.

Reproduction and spread

Dispersal of seed

- Fruit-eating birds are the main agents of dispersal, as they spread seed in their droppings.
- Some mammals also eat and disperse lantana seed.
- Studies have shown that germination is actually more likely if the seed has travelled through the gut of a bird or mammal.

Vegetative spread

- Lantana can spread via a process known as layering, where horizontal stems take root when they are in contact with moist soil.
- It will also reshoot vigorously from the base of vertical stems (and more slowly from the rooted horizontal stems), although it does not sucker from damaged or broken roots (for more information, see 'Regrowth and re-infestation' below).

Pollination

- Insects such as butterflies, moths, bees and thrips pollinate the flower clusters. Self-pollination is not common.
- Approximately half the flowers form clusters of single-seeded berries. A single plant can produce up to 12 000 fruit each year.



Fruit-eating birds can spread seed in their droppings.



Moth pollinating flowers.



Butterfly pollinating flowers.



Bee pollinating flowers.



Mick Richards

Seedling germinated in disturbed soil.



Andrew Clark

Regrowth from the base of stems.

Seed viability

- Some studies have shown that 50 per cent of seed will remain viable in dry conditions for up to two years, whereas other unpublished studies have shown seed viability of four to five years.
- Although the exact length of time seeds remain viable is not known, it is likely to depend on the variety of lantana, soil types and soil moisture levels.

Germination

- Activities that increase light intensity and soil temperature will stimulate germination of lantana seed. These include human disturbances such as clearing, construction and inappropriate burning; and pest animal activity such as pig rooting and rabbit burrowing.
- Seeds need warm temperatures and sufficient moisture to germinate. Germination is reduced by low light conditions.

Longevity

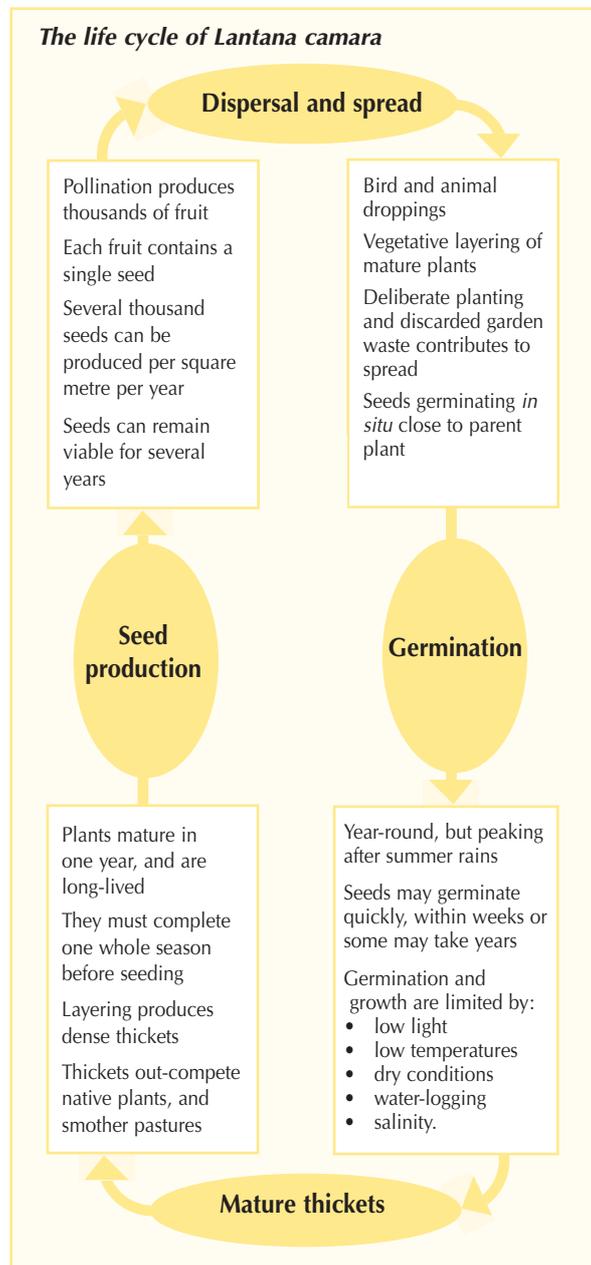
- Lantana is very long-lived under favourable conditions. Constantly renewed growth at the base of stems ensures its persistence. Plants tend to die only under extremely stressful conditions, such as extended drought or complete shading through canopy closure.

Birds that spread lantana

in eastern and northern Australia:

- brown pigeon
- emerald dove
- Lewins honeyeater
- little wattlebird
- pied currawong
- purple-crowned pigeon
- rainbow lorikeet
- red-crowned pigeon
- satin bowerbird
- silver-eye
- varied triller
- wonga pigeon.

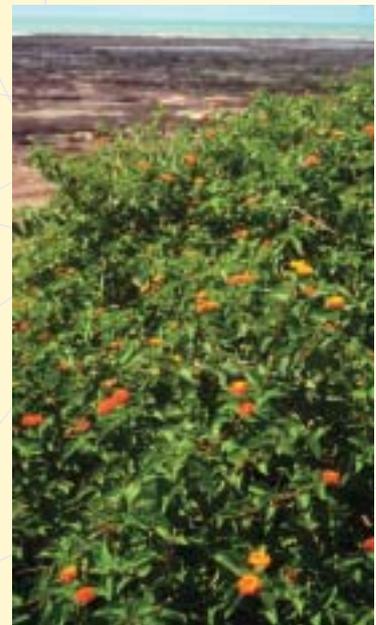
(Lyon and French 1991)



Distribution: current and potential infestations



Lantana was mapped in Brisbane in 1889.



Lantana infestation in the Northern Territory.

Colin Wilson, courtesy of DIPE, NT

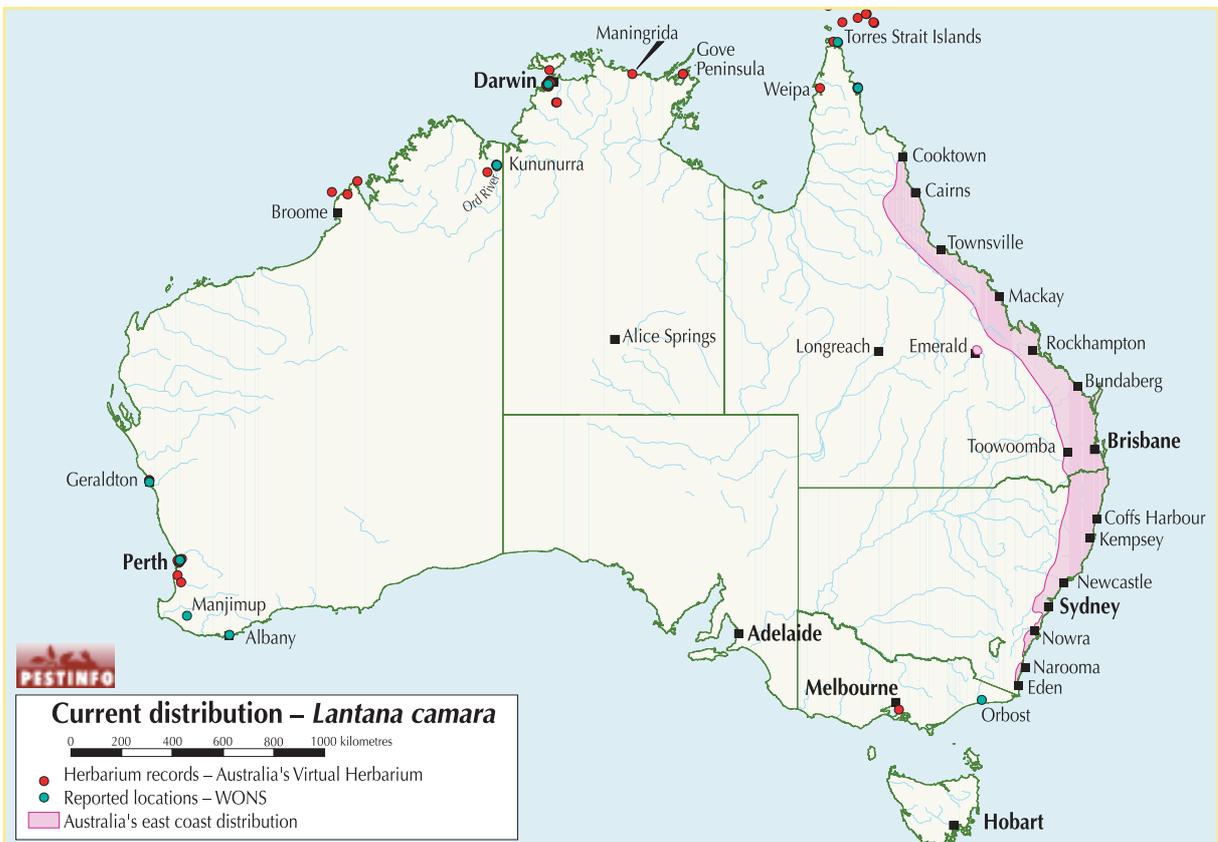
Distribution: current and potential infestations

Early history

Lantana has been a weed in Australia for over 160 years. It was first recorded in 1841 at the Adelaide Botanic Gardens, and, in 1889, dense stands were mapped close to the mouth of the Brisbane River. By 1897, it was described in Sydney as a 'most troublesome weed', which could form 'impenetrable thickets on the banks of streams, deserted farms and the edges of scrubs' (Bailey 1897).

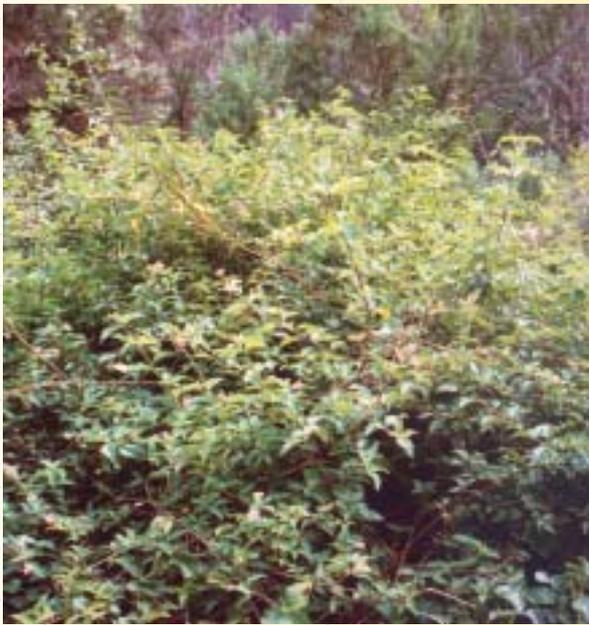
Current distribution

Lantana is widely distributed east of the Great Dividing Range, covering more than four million hectares from Eden in New South Wales, along the length of coastal New South Wales and Queensland, to the Torres Strait Islands. Isolated infestations have been reported in the Northern Territory (in and around Darwin, and on the Gove Peninsula) and in Western Australia (Albany, Manjimup, Geraldton, the Ord River south of Kununurra, and along the Canning and Swan Rivers around Perth), and in Victoria near Orbost.



Current distribution of *Lantana camara* in Australia.

Courtesy of Pestinfo Group, NRM&E and Australia's Virtual Herbarium, www.chah.gov.au/avh/



Andrew Clark

Lantana infestation in Eden, Southern NSW.



Courtesy of Hazel Dempster

Lantana infestation in Albany, WA.

Potential distribution

The ecological limitations to the distribution of lantana are unknown. Within the boundaries of its current distribution, it is continuing to infest new areas and increase in density. It is now present at the headwaters of major west-flowing catchments of the Murray–Darling Basin, and it may be able to spread further west along riparian corridors given favourable climatic conditions, and as a result of inappropriate land management practices.

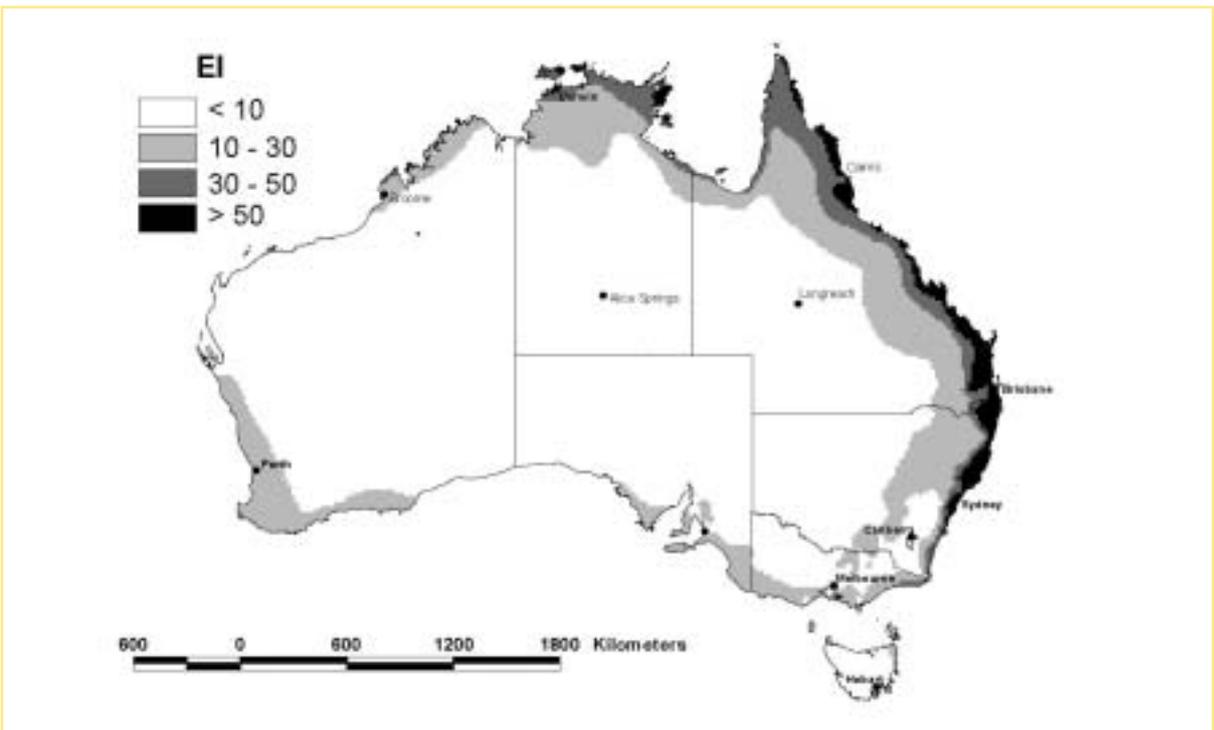
Modelling based on temperature, rainfall, extreme seasons, burning regimes and soil moisture has suggested the potential distribution of lantana extends across Cape York into the Northern Territory, the Kimberley Region and the southern coast of Western Australia, and further into Victoria.

That lantana is not yet present in these areas does not mean it is unsuited to them; it has been described as a ‘sleeper weed’, awaiting conditions favourable to spread.

Ornamental lantana increases the risks

Ornamental lantana is used in gardens and landscaping in all states and territories. Some commercial varieties previously thought to be sterile can in fact produce viable seed or hybridise with wild varieties, increasing genetic variation in the species complex. This continual variation may enhance the ability of lantana to adapt to new environments.

Report new lantana infestations to your local government.



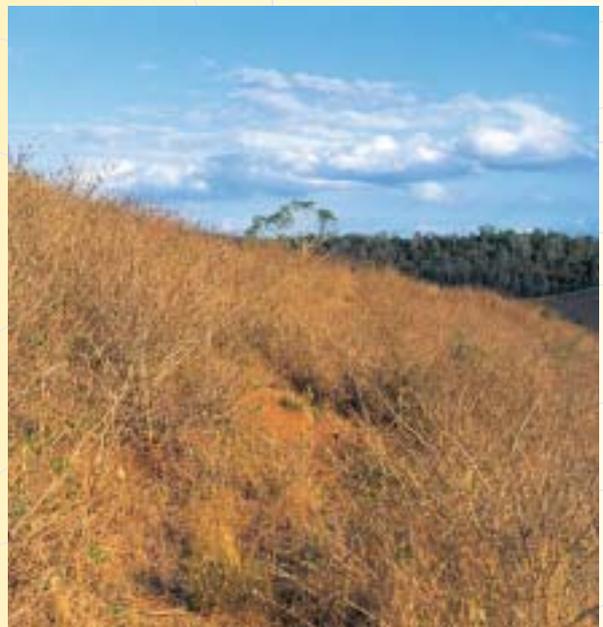
Courtesy of Ben Lawson, NRM&E

CLIMEX model showing the potential distribution of *Lantana camara* in Australia.

Effects of climate



Dry lantana, Cangai, NSW.



Drought-stressed lantana, Yarraman, Qld.

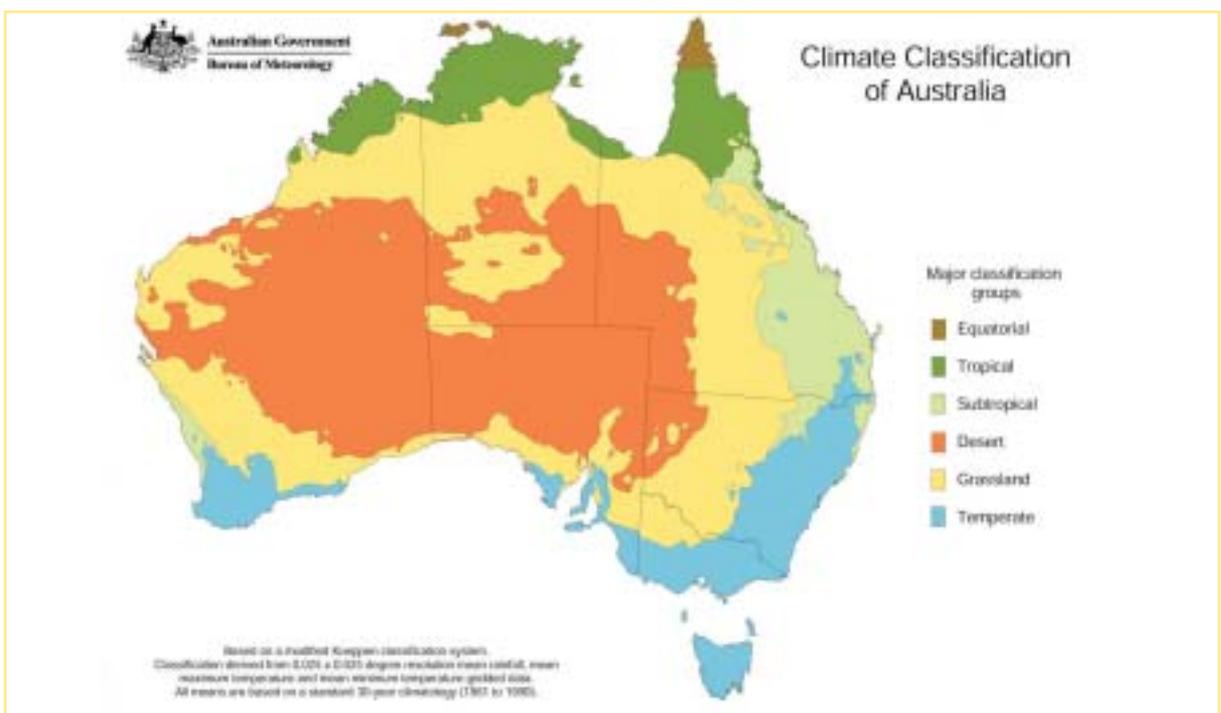
Effects of climate

Lantana is distributed across temperate, subtropical and tropical climates in Australia, with temperatures, rainfall, and other seasonal effects varying dramatically across this distribution. These variables affect germination, growth patterns and seed production, which will in turn influence the choice of control methods, the best timing for them and their success.

Lantana growth cycles

- In temperate climates with cool to cold winters and mild to warm summers (from southern Victoria to northern New South Wales), rainfall is fairly uniform throughout the year. Growth cycles of lantana in these areas respond to seasonal temperature changes, with growth slowing during colder periods.

- In subtropical climates (from coastal northern New South Wales to the Whitsunday Passage) and tropical climates (north of the Whitsunday Passage) summers are hot and humid, winters are mild and dry, and rainfall occurs mostly in summer. In these warmer climates, lantana can flower and fruit almost year-round, as long as soil moisture is available.
- Lantana can survive in some drier inland areas, where occasional soaking rains (about 25 mm) will trigger a distinct flush of flowering, followed by significant fruiting after four to six weeks.
- In areas of higher rainfall (where soil moisture is available year-round), germination appears to peak after the first summer rains.



Map indicating Australian climatic zones.

Courtesy of Australian Government Bureau of Meteorology



Andrew Clark

Frost-affected lantana, Grafton, NSW.



Andrew Clark

Stems and leaves killed by frost, Grafton, NSW.

Dry or frost-affected lantana

- Lantana can achieve remarkable drought tolerance under temporary dry conditions by dropping its leaves. Dry lantana can appear to be dead, but will reshoot from the base of the stems after rain.
- Frost-affected lantana also appears to be dead, but will reshoot from the base of the stems after spring rains. Severe frosts can kill the leaves and stems.
- Active regrowth (between 0.5 m and 1.0 m) from dry or frost-affected lantana is ideal for treatment with foliar applications of herbicide as access to the regrowth foliage is easier, and the reduced plant surface area requires less herbicide.
- Dry or frost-affected lantana can also be successfully grubbed out, as access to the base of the plant is easier.

Implications for control

- Seasonal and climatic variables can reduce the effectiveness of certain control methods, including foliar applications of herbicide, and control by fire and biological agents. Lantana must be actively growing for foliar applications of herbicide to be effective. Fire and biological control agents may be effective only at certain times of year. For more information, see section 2, 'Control methods'
- Other methods, such as mechanical and manual controls and cut stump or basal bark applications of herbicide, can generally be carried out year-round.

Keep a calendar of the growth cycles and flowering times of lantana in your area, and the best times for various control methods. Also consider the flowering and seeding times of pastures or native vegetation when choosing controls.



Mick Richards

Active growth, Springbrook National Park, Qld.

Regrowth and re-infestation



Mick Richards

Regrowth from windrows, Clairview, Qld.

Regrowth and re-infestation

Lantana is an extremely hardy and persistent weed. Without appropriate follow-up, initial control efforts in all situations are almost certain to result in re-infestation through the regrowth of existing plants and germination of new seedlings.

Regrowth from stems

Some of the methods of controlling lantana described in this manual (such as burning, slashing, foliar applications of herbicide, trampling and biological control agents) leave the plants rooted in the ground, without actually killing them, so that regrowth from the basal stems is highly likely.

Other methods (such as hand or mechanical grubbing or the cut stump method) leave biomass (stems or whole grubbed plants) at the site of the infestation. This is often used to advantage by chopping the stems for mulch or leaving them as fuel for controlled burning; however, re-infestation can

result as regrowth from live stems (even chopped ones) coming into contact with moist soil is very likely. In areas where fire is a threat, dry, dead biomass should be removed completely.

Even lantana that has been pushed into windrows will regrow if live stems are in contact with moist soil.

Re-infestation from seedlings

Germination of new lantana seedlings will increase after soil disturbance from mechanical controls, and after hand or mechanical removal if soaking rains follow. Areas around creeks, rivers, gullies and dams may experience higher rates of germination due to soil moisture.

Follow-up treatments are crucial to control regrowth and re-infestation.



Martin Hamman-Jones

Regrowth from basal stems is highly likely.