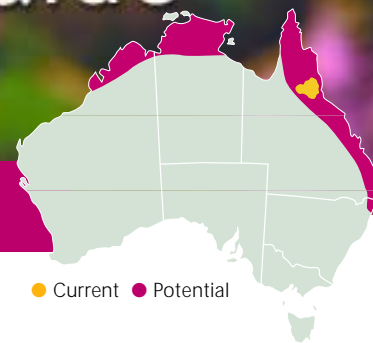


Weed Management Guide

Siam weed or chromolaena –
Chromolaena odorata



● Current ● Potential

Siam weed or chromolaena (*Chromolaena odorata*)

The problem

Siam weed is on the *Alert List for Environmental Weeds*, a list of 28 non-native plants that threaten biodiversity and cause other environmental damage. Although only in the early stages of establishment, these weeds have the potential to seriously degrade Australia's ecosystems.

Siam weed is recognised as one of the world's worst tropical weeds. It has an extremely fast growth rate (up to 20 mm per day) and prolific seed production. In the tropics of Africa and Asia it is a major pest of crops such as coconuts, rubber, tobacco and sugar cane. Some agricultural areas in South-East Asia have been abandoned because Siam weed has taken over pastures and crops. It is also toxic to stock.

Although only present in Australia in a few small infestations in Far North Queensland, Siam weed could degrade World Heritage-listed rainforests and riverbanks. It also has the potential to increase the fuel load in bushfires, and can cause allergic reactions.

The weed

Siam weed has a minimum life span of approximately ten years. In open areas it spreads into tangled, dense thickets up to 2 m tall, and higher when climbing up vegetation. Many paired branches grow off the main stem. The base of the



All plants in an infestation of Siam weed flower at the same time.
Photo: Colin G. Wilson

plant becomes hard and woody while the branch tips are soft and green. The leaves are arrowhead-shaped, 50–120 mm long and 30–70 mm wide, with three characteristic veins in a 'pitchfork' pattern. They grow in opposite pairs along the stems and branches. As the species name '*odorata*' suggests, the leaves emit a pungent odour when crushed.

Clusters of 10–35 pale pink–mauve tubular flowers, 10 mm long, are found at the ends of branches. The seeds are dark coloured, 4–5 mm long, narrow and oblong, with a parachute of white hairs which turn brown as the seed dries. The root system is fibrous and generally reaches a depth of 300 mm.

Key points

- Siam weed, one of the world's worst weeds, is established in a few small infestations in northern Queensland.
- It is far more cost-effective to prevent Siam weed's spread than to try to control large infestations.
- All known outbreaks of Siam weed are being controlled, with the aim of eradication.
- Siam weed flowers and seeds are conspicuous during June–July. If you find Siam weed, report it to your state or territory weed management agency, which will assist in eradicating it.

Growth calendar

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

■ General pattern of growth

Siam weed is a perennial species, as it lives for more than one year. It is very well adapted to the wet-dry tropical climate of Australia's north because its above-ground foliage can die off during the dry season (May–October) when virtually no rain falls. However, the roots remain alive and the vegetation grows back vigorously during the wet season (November–March).

Siam weed seeds germinate during the wet season. Seedling growth is prolific, and seedlings that have germinated early in the wet season may flower during the following flowering season in June–July. Because flowering is triggered by day length, all plants in an area flower at much the same time of the year. The fruits ripen and drop several months after flowering.

How it spreads

Siam weed spreads mostly through its numerous seeds – potentially in the millions in larger bushes – being easily transported short distances by wind due to the tufts of hair that catch any breeze. Seeds also readily become lodged in clothing, animal fur or machinery, and in this way Siam weed has spread large distances since initially being introduced

into India in the 1840s. In particular, much of the spread has been attributed to the movement of people, equipment and materials during World War II. It is now a serious weed throughout the Indian subcontinent and South-East Asia, and central, western and southern Africa. Siam weed is also present in many of Australia's near neighbours, including East Timor, Philippines, Papua New Guinea and several Pacific islands.



A parachute of brown hairs helps the seed spread short distances.
Photo: Colin G. Wilson



The flowers are pink-mauve and tubular; the leaves are arrowhead-shaped with serrated edges and veins in a 'pitchfork' pattern.
Photo: Colin G. Wilson

In Australia infestations of Siam weed were discovered in the Tully region of Far North Queensland in 1994. One large infestation had spread down the Tully River and another was found in pasture in the Bingil Bay area. Other smaller patches were located in the El Arish/Silkwood areas. These infestations are thought to have arisen from contaminated seed that was brought into Australia from Brazil in the 1970s.

Where it grows

Siam weed grows best in the tropics and subtropics, and though not tolerant of frost it can be found at altitudes up to 1000 m. It grows on most soil types but prefers well drained soils in full sun. It has a competitive advantage over other plants in climates with distinct wet and dry seasons because it survives fires and grows back vigorously following rain.

As an invasive, fast growing plant, Siam weed thrives in disturbed areas such as pastures, plantations, clearings, roadsides and riverbanks, particularly those in well-lit sites.

Siam weed is misleadingly named as it is actually a native of Central and northern South America, from Mexico to Brazil. Although first introduced into India as an ornamental, it has quickly spread throughout its current range.



Infestations of Siam weed throughout South-East Asia are potential sources of seed spread into Australia: West Timor, Indonesia.
Photo: Colin G. Wilson



Siam weed invades pastures and crops and has serious impacts on agriculture: West Timor, Indonesia.
Photo: Colin G. Wilson

Why we need to be 'alert' to Siam weed

Siam weed poses great risks to Australia's environment and economy. It:

- outcompetes and smothers crops and native vegetation
- is toxic to cattle

- is already present in a few small infestations in Far North Queensland. Seeds can remain viable in the soil for at least eight years, and therefore ongoing follow-up work is required
- could spread further into very large areas of the productive east coast and wet-dry tropics to the north

- has a history of being spread large distances with human activity and could easily be reintroduced into other parts of the country
- is present in Australia's neighbours to the immediate north and northeast, and is widespread throughout Asia and Africa.

The Alert List for Environmental Weeds

The Federal Government's *Alert List for Environmental Weeds* was declared in 2001. It consists of 28 weed species that currently have limited distributions but potentially could cause significant damage. The following weed species are therefore targeted for eradication:

Scientific name	Common name	Scientific name	Common name
<i>Acacia catechu</i> var. <i>sundra</i>	cutch tree	<i>Koelreuteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree
<i>Acacia karroo</i>	Karoo thorn	<i>Lachenalia reflexa</i>	yellow soldier
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	<i>Lagarosiphon major</i>	lagarosiphon
<i>Barleria prionitis</i>	barleria	<i>Nassella charruana</i>	lobed needle grass
<i>Bassia scoparia</i>	kochia	<i>Nassella hyalina</i>	cane needle grass
<i>Calluna vulgaris</i>	heather	<i>Pelargonium alchemilloides</i>	garden geranium
<i>Chromolaena odorata</i>	Siam weed	<i>Pereskia aculeata</i>	leaf cactus
<i>Cynoglossum creticum</i>	blue hound's tongue	<i>Piptochaetium montevidense</i>	Uruguayan rice grass
<i>Cyperus teneristolon</i>	cyperus	<i>Praxelis clematidea</i>	praxelis
<i>Cytisus multiflorus</i>	white Spanish broom	<i>Retama raetam</i>	white weeping broom
<i>Dittrichia viscosa</i>	false yellowhead	<i>Senecio glastifolius</i>	holly leaved senecio
<i>Equisetum</i> spp.	horsetail species	<i>Thunbergia laurifolia</i>	laurel clock vine
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	<i>Tipuana tipu</i>	rosewood
<i>Hieracium aurantiacum</i>	orange hawkweed	<i>Trianoptiles solitaria</i>	subterranean Cape sedge

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.tas.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

The above contacts can offer advice on weed control in your state or territory. If 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.

The East Timor infestation is of particular concern because of the large numbers of defence and non-defence personnel, equipment and vehicles returning to Australia from the area. Despite the vigilance of the Australian Quarantine and Inspection Service (AQIS), who are actively seeking Siam weed seeds in equipment and materials as they leave East Timor and arrive in Australia, there is a very high risk that it will be reintroduced to Australia.

If not quickly eradicated, a new infestation could rapidly become uncontrollable. The Queensland infestation has spread only moderately because the climate there is probably too wet. Under ideal conditions in East Timor, Siam weed has infested virtually the entire country in only 20 years.

What to do about it

Prevention is better than the cure

As with all weed management, prevention is better and more cost-effective than control. The annual cost of weeds to agriculture in Australia, in terms of decreased productivity and management costs, is conservatively estimated at \$4 billion. Environmental impacts are also

significant and lead to a loss of biodiversity. To limit escalation of these impacts, it is vital to prevent further introduction of new weed species, such as Siam weed, into uninfested natural ecosystems.

Early detection and eradication are also important to prevent the spread of Siam weed. Small infestations can be eradicated if they are detected early but an ongoing commitment is needed to ensure new infestations do not establish.

Quarantine is required to prevent further introductions

The importation of Siam weed into Australia is not permitted because of the

risk of further spread, and the potential introduction of new genetic diversity that could make future control more difficult.

There is a high probability of reintroducing Siam weed from infestations throughout South-East Asia, including East Timor, Papua New Guinea and some Pacific islands. For this reason a vigilant approach to surveillance and quarantine in northern Australia is required, especially around, but not limited to, military bases. Because military exercises are conducted in many parts of Australia, Siam weed could easily be spread to a remote location from military equipment used previously in East Timor.



Each seed head can contain hundreds of seeds; even small infestations can potentially produce millions of seeds per year.

Photo: Colin G. Wilson



An eradication program for Siam weed in Far North Queensland

In recognition of its potential for damage throughout northern Australia, the current infestations of Siam weed are the target of a nationally funded eradication project managed by the Queensland Department of Natural Resources and Mines (DNRM).

Herbicides are sprayed onto patches of Siam weed. Two full-time Strategic Weed Eradication and Education Project staff have been employed to eradicate, monitor and map known infestations, train local people and raise public awareness. Television commercials are broadcast in prime time and have been particularly effective in informing the community of the threats posed by Siam weed.

Helicopters are used to search for new infestations during flowering because the flowers and maturing seeds are highly visible from the air.

Some of the management strategies that are being used to combat the spread of Siam weed include:

- preventing the use of unsterilised sand from the Tully River
- maintaining strict hygiene standards for machinery in contact with the infestations
- preventing stock movements and the sale of pasture seed from the area
- regulating camping and bushwalking in the area

- continued monitoring and treatment of infestations by landowners and local government.

In mid 2003 an infestation of Siam weed outside the main site was reported by a landholder who had previously noticed an unusual plant but not recognised it as Siam weed until he saw the television commercial. This infestation and several others found at the same time were successfully treated by DNRM staff. However, the eradication team are facing a difficult task because the likelihood of eradication is diminished if infestations are allowed to flower and spread seed before being found and controlled.

Mail order seeds are another potential source of infestation. Do not buy seeds via the internet or from mail order catalogues unless you check with quarantine first and can be sure that they are free of weeds like Siam weed. Call 1800 803 006 or see the AQIS import conditions database <www.aqis.gov.au/icon>. Also, take care when travelling overseas that you do not choose souvenirs made from or containing seeds, or bring back seeds attached to hiking or camping equipment. Report any breaches of quarantine you see to AQIS.

Raising community awareness

Because there is a high probability of reintroducing Siam weed from overseas infestations, public awareness of the weed and its potential impacts should be increased. The public should also know how to identify Siam weed and what to do if they find it.

Apart from its conspicuous flower, which is present between June and July, Siam weed's leaf, with a pitchfork-style pattern of veins, is quite distinctive.

New infestations of Siam weed

Because there are relatively few Siam weed infestations, and it can potentially be eradicated before it becomes established, any new outbreaks should be reported immediately to your state or territory weed management agency or local council. Do not try to control Siam weed without their expert assistance. Control effort that is poorly performed or not followed up can actually help spread the weed and worsen the problem.



The larvae of the biological control gall fly (*Cecidochares connexa*) feed in the stem, which then swells into a gall and harms the plant. Photo: Colin G. Wilson

Biological control

The potential exists to treat Siam weed with biological control agents. A leaf feeding moth (*Pareuchaetes pseudoinsulata*) and a gall fly (*Cecidochares connexa*) have shown some success in controlling Siam weed in Indonesia. Biological control agents do not generally eradicate their targets however, which is the current aim of the Queensland management plan (see case study, above).

Legislation

Landholders are required by law to control Siam weed in Western Australia, the Northern Territory, Queensland and New South Wales.

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Maps: Data used in the compilation of actual and potential distribution maps provided by Australian herbaria via Australia's Virtual Herbarium and Sainty and Associates P/L, respectively.

If you find a plant that may be Siam weed

Quick reference guide

Identification

You will first need to confirm its identity. Contact your state or territory weed management agency for help in identifying the plant. You will need to take note of the characteristics of the plant in order to accurately describe it. Some important features of Siam weed include:

- flowers are pink–mauve, tubular and about 10 mm long
- seeds are spread by the wind, carried by a parachute of brown hairs. All Siam weed plants flower at the same time (June–July in Australia), resulting in a

carpet of off-white seeds on surrounding vegetation. The Queensland DNRM use this natural phenomenon to search for new infestations of Siam weed from the air

- leaves are arrowhead or diamond-shaped, with serrations on the outer edges and three veins running underneath the leaf surface in a characteristic 'pitchfork' pattern. The leaves give off a pungent odour when crushed.

Reporting occurrences

Once identified, new occurrences of Siam weed should be reported to the relevant state or territory weed

management agency or local council, who will offer advice and assistance on its control. Because it spreads so easily and poses such a serious threat, its control should be undertaken with the appropriate expertise and adequate resources.

Follow-up work will be required

Once the initial infestation is controlled, follow-up monitoring and control will be required to ensure that reinfestation does not occur.

Collecting specimens

State or territory herbaria can also identify plants from good specimens. These organisations can provide advice on how to collect and preserve specimens.

State/Territory	Postal Address	Phone	Web
Australian National Herbarium	GPO Box 1600 Canberra, ACT, 2601	(02) 6246 5108	www.anbg.gov.au/cpbr/herbarium/index.html
National Herbarium of New South Wales	Mrs Macquaries Rd Sydney, NSW, 2000	(02) 9231 8111	www.rbg Syd.nsw.gov.au
National Herbarium of Victoria	Private Bag 2000 Birdwood Avenue South Yarra, Vic, 3141	(03) 9252 2300	www.rbg.vic.gov.au/biodiversity/herbarium.html
Northern Territory Herbarium	PO Box 496 Palmerston, NT, 0831	(08) 8999 4516	http://www.nt.gov.au/ipe/pwcnt/
Queensland Herbarium	c/- Brisbane Botanic Gardens Mt Coot-tha Rd Toowong, Qld, 4066	(07) 3896 9326	www.env.qld.gov.au/environment/science/herbarium
South Australian Plant Biodiversity Centre	PO Box 2732 Kent Town, SA, 5071	(08) 8222 9311	www.flora.sa.gov.au/index.html
Tasmanian Herbarium	Private Bag 4 Hobart, Tas, 7000	(03) 6226 2635	www.tmag.tas.gov.au/Herbarium/Herbarium2.htm
Western Australian Herbarium	Locked Bag 104 Bentley DC, WA, 6983	(08) 9334 0500	http://science.calm.wa.gov.au/herbarium/

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