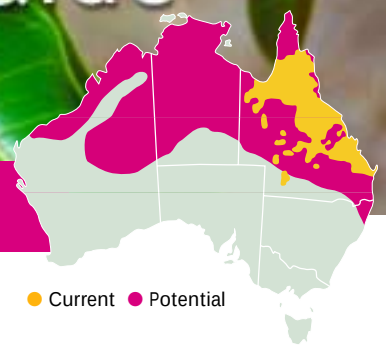
Weed Management Guide

Rubber vine –
Cryptostegia grandiflora



Rubber vine (*Cryptostegia grandiflora*)

The problem

Rubber vine 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.

Rubber vine has impacts on pastoral and conservation areas of northeastern Australia. Its main impact on pastoralism is the loss of grazing country, which in 1995 was estimated to cost the Queensland beef industry $18 million. It also increases the costs of mustering and fencing.

Rubber vine threatens waterways, woodlands and rainforests throughout northeastern Australia, including significant conservation areas such as the Wet Tropics World Heritage Area and Cape York. It also severely threatens riverine vegetation, and can potentially displace the plants and animals that inhabit riverbanks, thereby affecting the water quality of streams. The whole ecological integrity of native vine thickets and riverine systems of northern Australia is under threat from rubber vine.

Rubber vine smothers and kills native vegetation. It is a severe threat to biodiversity in northern Australia: Burdekin River, Qld.
Photo: Colin G. Wilson

The weed

Rubber vine is a many stemmed shrub which can climb 30 m into tree canopies, or grow 1–3 m high when unsupported in open areas. The stems are greyish brown with a smooth bark and have two forms: a leaf-bearing branched stem and a longer unbranched 'whip' with fewer leaves that extends onto nearby adjacent vegetation. The plant exudes a milky sap if scratched or broken.

The leaves occur in pairs and are a glossy dark green in colour. They are oval-shaped with tapered ends (elliptical), 60–100 mm long and 30–50 mm wide. The trumpet-shaped flowers are quite large, up to 50 mm long and wide, with five light purple to white petals.

The seed pods are rigid and usually occur in opposing pairs at the end of short stalks, but are quite common as single pods and occasionally triple pods. The pods are up to 120 mm long and 40 mm wide. The brown seeds are flat with a tuft of long, white, silky hairs at one end. Roots grow to a depth of 12 m.

Key points

- Rubber vine threatens to choke the waterways, vine forests and pastures of northern Australia.
- Its westward spread must be prevented to protect environmental and economic interests in the Northern Territory and northern Western Australia.
- A containment line helps to prioritise infestations for control and to monitor progress.
- Existing control techniques (chemical, mechanical, biological and fire) should be integrated for maximum effect.
- Follow-up work needs to be ongoing, especially if seeds re-enter the site.

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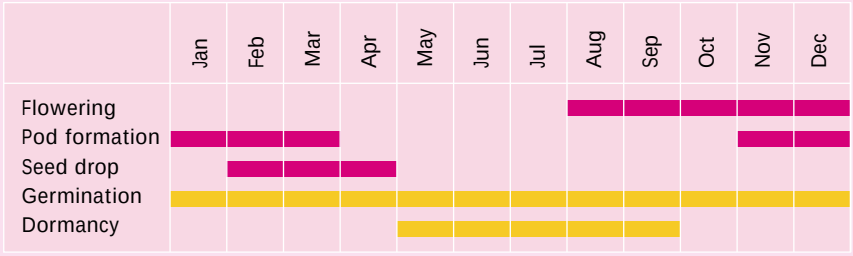
Growth calendar



Rubber vine seedlings do not flower until the diameter of the stem at its base is at least 15 mm. Under normal conditions in Queensland this occurs shortly after the first year of growth. Although rubber vine can flower at almost any time of the year, most flowering takes place in summer. Seed pod formation usually occurs from summer to late autumn. Seed pods are not generally formed until the stem diameter has reached 35 mm at its base. The pods dry out and are ripe after about 200 days, when they split open and release the seeds.

Germination occurs following good rain. Seeds need between 5 and 15 days exposure to moist, warm (20–30ºC) conditions before they will germinate. Wet, shaded areas that protect the seeds from drying out are therefore ideal for rubber vine.

Rubber vine plants are thought to live for up to 80 years.

Rubber vine mainly flowers during summer: Charters Towers, Qld, in December.
Photo: Colin G. Wilson

Rubber vine was first planted in the gardens of mining towns of northern Queensland in the late 1860s. Weedy infestations were reported by 1917. During the Second World War rubber vine was cultivated as a potential source of rubber, contributing to its spread.

In 1991 the total area of rubber vine infestation was estimated at over 700,000 ha of tropical and subtropical Queensland, although it was present over an area 50 times as large. Two infestations, since controlled, were also found in northern Western Australia in the 1990s.

How it spreads

About 95% of seed produced by rubber vine is viable. It is scattered short distances from the parent plant by wind that catches the tufts on the seed ends, or longer distances by floating on floodwaters. Most seed remains viable even after the pods have floated on fresh or salt water for over a month, potentially leading to spread between catchments.

Seeds can also be potentially spread by birds, or in mud attached to vehicles, machinery and animals.

With each seed pod producing between 340 and 840 seeds, a hectare of rubber vine can produce millions of seeds every year. However, the seed is not long lived. If conditions are too dry to allow germination, most of the seed will die after one year.

Each seed pod can produce over 800 seeds, which are spread short distances when the tufts are blown by the wind.
Photo: Colin G. Wilson

Where it grows

Rubber vine typically invades new areas when seed is blown in or transported down a waterway. Seed germinates readily on riverbanks and other moist areas, and the young plants rapidly grow over and smother other plants, often completely dominating the vegetation. It then spreads aggressively from the riverbank to adjoining open woodland and/or pastures.

Currently, rubber vine is restricted to areas receiving between 400 and 1400 mm of mainly summer rain. It grows on all soil types, but is more likely to germinate on soils that retain moisture.

Rubber vine is native to southwestern Madagascar. It has become weedy in other countries throughout East Africa, South-East Asia, the United States, and Central and South America.

Potential distribution

Based on its climatic requirements, rubber vine has a potential distribution covering all of northern Queensland and northern Northern Territory, and most of the Kimberley and Pilbara regions of Western Australia. Parts of northeastern New South Wales could also be affected.

What to do about it

Prevention of spread outside the Rubber Vine Containment Line

Prevention is the cheapest form of controlling rubber vine. The Rubber Vine Containment Line was surveyed in the early 1990s to highlight areas infested with the weed and help plan control efforts. Strategies inside the containment line are focused on managing its impact. Any infestations outside the containment line are targeted for control to prevent its spread into new areas.

Other ways to prevent the spread of rubber vine include:

- preventing its sale and planting by declaring it a weed across all states and territories
- preventing further importation
- raising public awareness of the problems.

How to control rubber vine

Early efforts to control rubber vine have improved our understanding of control techniques and how to combine, or integrate, different methods to give the best results. There are four main methods that are used to control the weed: biological, chemical, fire and mechanical.

The longer unbranched 'whip' extends out of the top of vines. It has few leaves but is used to climb onto other vegetation.
Photo: Joe Vitelli, Qld DNRM

A strategic plan for integrated management of rubber vine

The Queensland Department of Natural Resources and Mines and the National Rubber Vine Management Group have developed the 'Rubber Vine Management Manual – Control and Case Studies', with funding contributed by the National Weeds Program of the Natural Heritage Trust. It contains the five-step approach to planning which is summarised below.

Accurate mapping of all infestations is an ideal starting point that will provide the information required to identify infestations as priorities for control.

Control attempts should aim to kill plants before they set seed, first targeting outlying or small infestations and working towards the centre. Because wind and water are the main ways in which seed is spread, prioritise infestations that are likely to be a source of seeds (eg in upper catchments, or upwind in relation to prevailing winds). Infestations that have severe impacts on property maintenance (eg watering or mustering points) or primary production might also be high priorities for control.

Choosing appropriate control methods is a key part of the strategic plan. Aiming for maximum effect with minimum cost, it is important to first evaluate what resources (eg labour, herbicides, spray equipment, machinery) are available. Part of this evaluation will be assessing the different costs of each control method and of each of the identified priorities, and developing a financial plan for both the short and long terms.

Finally, it is important to target control efforts to suitable times of the year to take advantage of differences between seasons or any abnormal fluctuations (such as drought or flooding). For example, good rains generate pasture growth, which can be used to fuel fires.

Larvae of the biological control agent *Euclasta whalleyi* feeding on rubber vine leaves, Charters Towers, June.
Photo: Rachel McFadyen

Adult *Euclasta whalleyi* are active at night, and are recognisable by a black spot on the wing and their habit of resting with their wings at an angle of 45º to a vertical surface.
Photo: Rachel McFadyen

Biological control reduces rubber vine's vigour

Two biological control agents have become widespread in Queensland since their release in the early 1990s. The rubber vine rust *Maravalia cryptostegiae* forms on the underside of leaves and causes them to turn yellow and drop. The rust thrives during the wet season but is less active over the dry season. Frequent showers early in the season should result in heavy infestations of rust.

The other agent is the moth *Euclasta whalleyi*, whose caterpillars feed on rubber vine leaves between March and October. The moth has a black spot on each wing and characteristically rests with its wings folded at 45º to a vertical surface. The caterpillars tend to feed on the underside of new leaves, often leaving fine silken threads and black bead-like droppings.

Both agents, especially the rust, cause damage (eg reduced flowering, seed pod production and leaf cover) and occasionally the death of established plants. However, their effectiveness varies with climatic conditions.

Herbicides are effective but expensive

The strategic use of a range of registered herbicides is an effective method of controlling isolated or outlying rubber vine plants. Foliar spraying the entire plant from the ground and aerial spraying are most effective on smaller plants (less than 2 m tall, stem diameter less than 35 mm). However, note that leaves infected by the biocontrol rust will not take up herbicides. The basal bark technique, which uses spraying around the lowest bark up to a height of 500 mm (knee height), is effective on plants of stem diameter less than 35 mm at the base. For thicker rubber vine, up to 90 mm stem diameter at base, basal bark spray to 1 m high. Foliar, aerial and basal bark spraying should only be conducted when rubber vine is actively growing.

When the stem diameter at the base exceeds 90 mm, or if the stems are heavily intertwined, the cut-stump method is preferred. The stems should be cut as close to the ground as possible using a machete or chainsaw, and immediately painted with herbicide. The cut-stump method uses minimal herbicides and is effective at all times but is labour intensive and therefore best suited to scattered infestations.

Soil-applied residual herbicides are effective when applied before rain. Soil type limits their effectiveness, and there are other important considerations such as run-off and impacts on non-target trees. It is highly recommended that advice is obtained from the relevant state/territory weed management agency prior to the use of soil-applied herbicides.

Fire is relatively inexpensive and kills rubber vine

Fire is an especially valuable part of the integrated control of rubber vine because it kills surface seeds, seedlings and adult plants, yet is relatively inexpensive. If there is sufficient fuel, rubber vine can be burnt whilst green with good success. Infestations may require an initial burn to open them out, a follow-up burn to control regrowth and seedlings in the next 12 months, and another burn several

Weed control contacts

State / Territory	Department	Phone	Email	Website
NSW	NSW Agriculture	1800 680 244	weeds@agric.nsw.gov.au	www.agric.nsw.gov.au
NT	Dept of Natural Resources, Environment and the Arts	(08) 8999 4567	weedinfo.nreta@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
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

For up-to-date information on which herbicides are registered to control rubber vine and the best application methods and dosages, contact your state or territory weed management agency or local council. This information varies from state to state and from time to time. 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 river banks.

years later to continue the follow-up. In a fire research experiment west of Chillagoe in Queensland, 80% of rubber vine was killed in an initial fire (October 1997). A follow-up burn one year later resulted in a 99% kill rate.

The timing of fire is crucial to its success as fires must be hot enough to kill mature rubber vine. The fuel load should be about 1500 kg/ha, the equivalent of a relatively thin pasture. Pasture may need to be fenced off, or spelled, before burning to allow it to build to high enough levels. These costs, and the construction of fire breaks, make up the bulk of the costs associated with fire.

Fire combined with biocontrol provides cost-effective control of rubber vine

It is advisable to burn after first rains as this reduces the risk of prolonged periods of bare earth and erosion. Other factors that must be considered when using fire include its impacts on pastures and natural ecosystems, risks to stock and property, and loss of nutrients. Permits may be required to light fires – check with your local council or state or territory weed management agency.

With sufficient fuel (grasses, rubber vine leaves, other vegetation), fire can successfully control rubber vine. Fire is especially efficient in combination with rubber vine rust.
Photo: Joe Vitelli, Qld DNRM

Mechanical control helps gain access

Blade or disc ploughs and cutter bars provide reasonable control of rubber vine, but are most often used to penetrate very dense infestations to allow easier access or to open up the canopy. Slashing harms the plant but often does not kill it.

Mechanical control is mainly used to open up infestations and allow better access to rubber vine for herbicide application or to help provide fuel for fires.
Photo: Joe Vitelli, Qld DNRM

The seed pods normally form between December and April, and occur in pairs at the end of stems.
Photo: Rachel McFadyen

Mechanical control is not suited to core problem areas such as gullies and creeks because it can lead to erosion. Also, care must be taken not to inadvertently bury plant material (eg seeds, stems) that could be protected from a fire. Permits may be required to conduct mechanical control if native species will be affected. Weed control contacts (see table p. 5) will be able to provide relevant advice.

Chemical, mechanical and biological control, fire and grazing management can be integrated together to manage rubber vine in the long term

Integrated management is most effective

Recent research has shown that the use of fire after biological control can be highly effective. The biocontrol rust causes leaf drop, which opens up infestations and allows grasses to grow underneath. Combined with the rubber vine leaf litter, these grasses can provide the perfect environment for fires, resulting in excellent, cost-effective control.

However, there is no single method of integrating techniques that is suitable for all infestations; control programs should be tailored to the location, size, intensity and age of each situation. Other factors that must also be considered are the effects on other vegetation and the availability of resources for control and follow-up operations. Landholders should contact their local weeds officer or lands protection officer for the most appropriate strategy.

Controlling rubber vine is hard work and requires ongoing commitment. The benefits of controlling it include: recovered pasture, increased production, reduced mustering costs and the protection of natural ecosystems, plants and animals.

Cryptostegia madagascariensis is similar in appearance to rubber vine, and poses similar threats as it escapes from gardens.
Photo: Colin G. Wilson

Another weedy species of *Cryptostegia*

Cryptostegia madagascariensis is closely related to rubber vine, and also occurs either in gardens or as a naturalised weed in Western Australia, the Northern Territory and Queensland. Its flowers are slightly smaller and a deeper pink colour but it is otherwise difficult to separate the two species. The risks posed by *Cryptostegia madagascariensis* are high, especially because it could cross-breed with rubber vine. Note that the common name 'rubber vine' may also be used for other unrelated nursery plants.

...case study

Protecting the Channel Country

Holmleigh Station is a cattle property south of Prairie in the uplands of Tower Creek in northern Queensland. John and Bub Teakle run about 600 head on the 15,600 ha station, which forms part of the very upper Lake Eyre Basin.

The Teakles did not take much notice of the rubber vine when they first took over the station in 1989. The extent of the problem was revealed in 1992 when the Strategic Weed Eradication and Education Program (SWEEP) helped to map the infestation, and found that it followed Tower Creek through Holmleigh and adjoining stations for about 9 km.

According to John Teakle, one of the main problems with rubber vine is that "the cattle get hidden in it when mustering – once they know it's there the cattle will look for it". Although both biocontrol agents are present, it is too dry for the rust and the moth is prone to parasitism.

In the Tower Creek area SWEEP provided an initial control effort aimed at knocking out the bulk of the rubber vine stands. The SWEEP team used foliar applied herbicides, but could not get access to some very dense infestations. Although they made some progress, upstream plants continually reinfested treated areas, and the ongoing follow-up that was required was beyond the resources of most of the landholders.

Since that initial control attempt, John Teakle has used fire to gain better access and help thin out dense infestations. "Fire is the first thing anyone should do…Burn any time you can get a fire to burn and it's safe to burn", he says. It is crucial that the fires are intense enough to burn up through the green rubber vine and kill it. Fire is a relatively inexpensive method of control and can help to reduce the amount of seed produced.

With funding secured through the Natural Heritage Trust, the Teakles have employed contractors to help with chemical control of rubber vine, using the cut-stump technique for plants over 30 mm diameter and basal bark spraying for anything smaller.

The Teakles are not seeking major economic gains from rubber vine control as it does not spread into their pastures. They mainly see the benefits in clearing their property and protecting the downstream Channel Country.

Rubber vine infestation in Qld, where the total area of infestation was estimated at 700,000 ha in 1991. Its total range extends across some 35 million ha, or 20% of the state.
Photo: Joe Vitelli, Qld DNRM

Legislation

Landholders throughout Western Australia, the Northern Territory and Queensland are required by law to control both species of *Cryptostegia* that occur on their land. Check with your local council or state/territory government agency about its requirements for rubber vine control.

Acknowledgments

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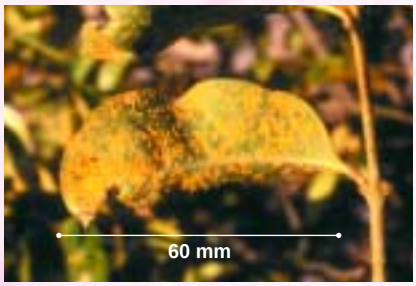
Maps: Australian Weeds Committee.

How to control rubber vine

Quick reference guide

Prevent spread outside the containment line

All infestations outside the Rubber Vine Containment Line should be controlled to prevent further spread. Monitoring and early detection are required to target these infestations. Communication and education are critical to achieving early detection in new areas.



The rubber vine rust *Maravalia cryptostegiae* appears as yellow blotches on the underside of the leaves. It thrives in the wet season, particularly after steady early rains.
Photo: Rachel McFadyen

Integrated management within the containment line

Infestations within the Rubber Vine Containment Line should be managed to minimise impacts and reduce the amount of seed produced. Integrated control using a mix of fire, biological, mechanical and chemical methods is the most cost-effective long-term approach.

The five step approach to planning

Use the five step planning approach, as devised by the Queensland Department of Natural Resources and Mines and the National Rubber Vine Management Group:

1. Map infestations on your property.
2. Target sites that are sources of seed spread, strategically important or essential for property management.
3. Determine the availability of resources (eg herbicides, labour) and suitability of methods for different infestations (eg herbicides are too expensive for very dense or large infestations, fire is especially effective after rust infection).
4. Estimate the cost of the program and incorporate into the short- and long-term property budget.
5. Calendar control efforts for maximum results and minimum effort. For example, wait until an adequate fuel load exists before using fire.

Ongoing follow-up

Follow-up control must be diligent and ongoing, as rubber vine can quickly reinfest.

Control options

Type of infestation	Fire	Mechanical	Chemical	Biological
Light (less than 1000 plants per ha)	Moderately hot fires using grass as a fuel will give good kill rates.	Slashing kills only about 50% of rubber vine. Consider other methods.	Foliar or basal bark spray, or use cut-stump method with registered herbicide when actively growing.	Two biological agents are having an impact in reducing the health and spread of rubber vine – the rubber vine rust and the rubber vine moth. An additional benefit of the rust is that it opens up the canopy to allow flammable undergrowth to grow. However, biocontrol agents will only rarely kill mature rubber vine plants on their own.
Medium (1000–2000 plants per ha)	Hotter fires are required to ignite and kill rubber vine in denser infestations. Either exclude stock to build up fuel, or burn after rust has defoliated rubber vine. Ideally, burn in late spring or after rain to avoid bare earth and erosion.	Cutter bar gives best control. Do not use on steep slopes.	Foliar or aerial spray, or apply registered herbicide to soil when actively growing.	
Heavy (more than 2000 plants per ha)		Blade ploughing can kill most rubber vine, but is mainly used to open up infestations and allow better access. Do not use on steep slopes.	Aerial spray or apply registered herbicide to soil. Note it is very expensive to control large infestations with herbicides, and foliar sprayed herbicides are less effective on rubber vine infected with rust.	

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