Control methods and case studies

Rubber vine management

May 2004

Natural Heritage Trust
Helping Communities Helping Australia

National Rubber Vine Management Group

This manual is sponsored by the National Weeds Program (Natural Heritage Trust), and the Queensland Department of Natural Resources, Mines and Energy

Project undertaken by Land Protection, Department of Natural Resources, Mines and Energy

QNRME04122
ISBN 1 920920 53 6
#16905

Editing, design, proofreading and production:
Web and Publishing Services, Department of Natural Resources, Mines and Energy

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Foreword

Rubber vine is one of northern Australia's worst weeds. It invades creeks and rivers, forming thickets and smothering vegetation, taking over flood plains and pastures. It infests over 700 000 hectares in Queensland, and if left unchecked will invade the Northern Territory and Western Australia.

The National Rubber Vine Management Group recognises that only through a joint effort and the diligence and commitment of all affected landholders, community and all levels of government will we be able to gain control of this weed.

This manual is an update of the previously published *Managing Rubber Vine—An experience based approach to managing a weed of national significance* (2000). It includes a comprehensive range of techniques for controlling rubber vine, and a selection of case studies demonstrating landholder approaches and experiences.

I recommend this manual to all landholders affected by rubber vine, and suggest its reading by others at risk of invasion by this pest.

Thank you to all the landholders and the staff from the Department of Natural Resources, Mines and Energy who have contributed in any way to this edition.

R.D. (Doug) Quirk
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The National Rubber Vine Management Group provided valuable comment and peer review during the development of this manual. Thanks to Mark Bickhoff, Peter Austin, Alice Beilby, Nora Brandli, Charles Curry, Colin Dollery, Ann Kirk, Lesley Marshall, Steve Matheson, John McKenzie, Darren Moor, Doug Quirk, Robert Rae, Allan Smith.

The authors would also like to acknowledge the work and effort that went into the development of *Managing Rubber Vine—An experience based approach to managing a weed of national significance (2000)*, which provided a basis for the development of this manual.

Thanks to Moya Calvert who developed the predicted distribution map and modified the rubber vine containment line map.

The case studies in this manual would not have been possible without the valuable knowledge and experience of Brett and Jenny Epple, Luke Ferguson and John McCabe, Colin and Shirley Healing, Tom and Belinda Keats, Darryl and Debbie Knuth, Ross McKenzie, Greg and Carole Ryan, Bob and Betty Shoyer, Ray Tapiolas, John and Bub Teakle, and Allan Tomley.

The photo on page 5 is courtesy of Jenny Milson, Department of Primary Industries & Fisheries, Queensland.

Rubber vine: ecology and threat

Section 1

Section 1

Rubber vine: ecology and threat

Introduction

Rubber vine (*Cryptostegia grandiflora*)—one of northern Australia's worst weeds—is among Australia's 20 Weeds of National Significance. A national strategic plan for control of rubber vine has been developed, outlining four programs to prevent its spread, reduce its impact, manage it nationally, and coordinate management.

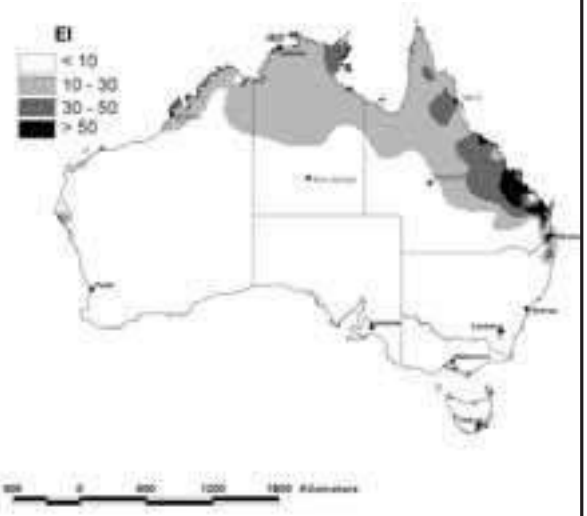
Rubber vine is a woody perennial vine that colonises areas aggressively, forming impenetrable thickets that smother vegetation. It impacts on native ecosystems, primary industries and tourism.

It is quite distinct from most other plants although it may be confused with some native vines and *C. madagascariensis*, a close relative. In Madagascar these two species have been shown to hybridise. *C. madagascariensis* is also a 'declared weed' in Western Australia and Queensland.

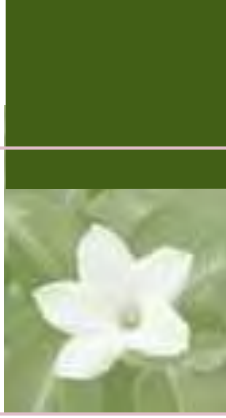
Rubber vine prefers areas where annual rainfall is between 400 and 1400 millimetres (mm), and is well adapted to a monsoonal climate. In Queensland, infestations are now found throughout the river systems of southern Cape York and the Gulf of Carpentaria, and south along the coast to the Burnett River. Isolated infestations have been recorded and subsequently controlled as far south as Gatton, south-west to Charleville, Longreach and Blackall, and as far west as the Kimberly region in Western Australia. No rubber vine has been recorded in the Northern Territory; however, there are infestations near the Northern Territory – Queensland border.

▲ Rubber vine smothers native vegetation.

Potential distribution of rubber vine in Australia (CLIMEX data)



(Data is splined from a CLIMEX prediction. EI = Ecoclimatic index: EI<10 potential for permanent population low, EI>70 potential extremely high).



This manual outlines a range of strategies and methods for the control of rubber vine. It includes case studies written by land mangers, who explain why and how they control it. They also discuss their motivations for doing so—these include improving productivity, being responsible landholders, removing the pest from their best country, and protecting properties downstream. Collectively, authors recommend the early control of rubber vine before it spreads, and stress the need to monitor regularly and maintain follow-up control.

History of spread

Rubber vine is a native of south-west Madagascar. The exact date of its introduction into Australia is not known but it was prior to, or about, 1875. It was a popular ornamental plant in north Queensland mining settlements, favoured for its luxuriant growth even under harsh conditions.

By 1917 there were major infestations around Rockhampton, Charters Towers and Georgetown. During the Second World War, efforts were made to grow rubber vine as a rubber source and although the enterprise was not successfully developed, it may have led to further spread.

Rubber vine was declared a noxious weed in Queensland in 1955. It is now present across 20 per cent of the state and densely infests over 700 000 hectares (ha), costing the Queensland beef industry in excess of $18 million per year due to loss of pasture and reduced beef production.

Description

Rubber vine is a vigorous climber with twining, whip-like shoots. It can grow unsupported as an untidy, many-stemmed shrub to 2 metres (m) in height, or scramble up to 30 m high in trees. Individual plants have been known to live for more than 80 years.

The stems, leaves and unripe pods exude a white, milky sap when broken or cut. Leaves are glossy dark green, smooth and thick, 6–10 centimetres (cm) long, 3–5 cm wide, occurring in opposite pairs. Rubber vine tends to be deciduous, shedding its leaves at the onset of winter; however, when it grows along creeks and rivers it can retain them till later in the season.

Rubber vine can grow as an unsupported shrub.

▲ Flowers are bell-shape with five petals and leaves are glossy dark green.

Rubber vine can take from less than one, to more than four years to flower, depending on the availability of soil moisture. Flowers are 5–6 cm long with five white to pale pink/purple petals arranged in a bell shape. Peak flowering occurs from October to April following rainfall events.

Rubber vine produces rigid seed pods that grow mostly in pairs at the end of a short stalk. They mature about six months (180 days) after flowering. They are 10–12 cm long, 3–4 cm wide and contain an average of 350 brown seeds, 95 per cent of which are viable. Each seed has a tuft of long white silky hairs that enable easy dispersal by wind and water. Animals, birds in particular, also spread the seed.

Rubber vine is poisonous to stock, with most deaths occurring after animals have been stressed or when other feed is scarce. Greg Ryan of Green Hills near Georgetown, has found that '...when cattle eat it, they really hook into it, ...and if they've eaten a fair bit and you try to handle them, they'll die. It could be something to do with their heart—they don't have to do much, just trot a couple of hundred metres and then fall down. I've never seen one get up after it's fallen.'

Rubber vine can be confused with its close relative *C. madagascariensis*, and the native vines *Marsdenia australis* , *M. viridiflora* and *Gymnanthera oblonga*. Rubber vine is best distinguished from all these species by its flowers and pods. *C. madagascariensis* is distinguished from rubber vine (*C. grandiflora*) by its shorter pods, smaller number of seeds (up to 126 per pod), white-coloured leaf mid-ribs and stalks, and purplish flowers. In Madagascar these two species have been shown to hybridise.

▲ Seed pods occur mostly in pairs at the end of a short stalk.

Bush banana (*M. australis*) and related species *M. viridiflora* tend to have clusters of creamy-white, bell-shaped flowers. Pods are large, fleshy and oblong-shaped, and grow to 4–10 cm.

If you are unsure about the identification of rubber vine, contact your local government weeds officer.

▲ Seedlings tend to have a more overall purple colour then adult plants.

▲ *Gymnanthera oblonga* is easily distinguished from rubber vine by its pods (top) and flowers (bottom).

◀ Fruit of *Marsdenia australis* and *Marsdenia viridiflora* (photo) are clearly different to rubber vine pods.

Jenny Milson, Department of Primary Industries and Fisheries, Queensland.

The impact of rubber vine

Rubber vine generally invades waterways first, where the seeds germinate in moist silt layers after rain. The plant smothers riparian vegetation and forms dense, sometimes impenetrable thickets. Infestations expand outward colonising flood plains, pastures and hillsides.

Its effects include:

- choking native vegetation, damaging native ecosystems and decreasing biodiversity
- preventing access of both stock and native animals to water
- harbouring feral animals such as wild pigs
- increasing the difficulty of mustering
- causing loss of pasture and grazing land
- increasing the risk of soil erosion due to decreased ground cover.

As the heaviest infestations usually occur on the best grazing country, rubber vine directly affects a property's primary resources. If the impacts are severe, productive capacity is adversely affected and the capital value of the land decreases, so it is important to tackle the problem early.

Managing rubber vine

Section 2

Section 2

Managing rubber vine

Seeds are easily dispersed by wind, water and birds.

Reducing the risk of infestation

Though in the long term, prevention is the best way to control weeds, this is not always possible. In the case of rubber vine, natural means—wind, water and birds—easily disperse the seed. New infestations must therefore be identified quickly and controlled before they become established. Several of the landholder case studies indicate that controlling rubber vine would have been easier if they had taken steps to remove it before it 'took off'.

Maintaining good pasture competition is also beneficial in preventing the establishment and spread of rubber vine.

Rubber vine containment line

Prevention of spread is a major objective of the national strategic plan for rubber vine. One of the strategies used is the rubber vine containment line (RVCL), which:

- defines a line at which to stop the spread of rubber vine
- highlights outlying infestations for priority control
- defines a long-term intention of removing all rubber vine outside the line
- encourages landholders within and near the containment line to participate in management programs that aim to increase their knowledge and interest in control of the pest
- is a tool that can be used in developing strategic plans, including pest management plans, regional plans, state plans and national strategies
- can be used to measure the success of the fight against rubber vine.

The Department of Natural Resources, Mines and Energy (NRM&E) regularly reviews the RVCL, in collaboration with the National Rubber Vine Management Group and other regional natural resource management groups.

Planning

Careful planning of a control program can save time and money and define a path toward achieving the desired outcome. To do this, it is necessary to have a realistic view of how rubber vine impacts on overall property management.

Planning takes place at a number of levels: from paddock to property level; at local government level through the development of local government pest management plans; at catchment level; and at a regional level through regional strategy groups. To help create a greater sense of involvement, it may be advantageous to involve others who are directly affected in the planning process.

A successful plan cannot be developed in isolation from other property operations and must be integrated into the overall property management plan. The management principles suggested here for control or eradication of rubber vine can be applied to other weeds on a property and ideally, strategies for management of all weeds should be included on a single plan.

It is recommended that a weed control plan have at least a 5–10 year time frame and be reviewed annually.

A range of planning processes can be adopted. There are six steps in the following suggested control and eradication plan.

Step 1: Identify and prioritise problem areas

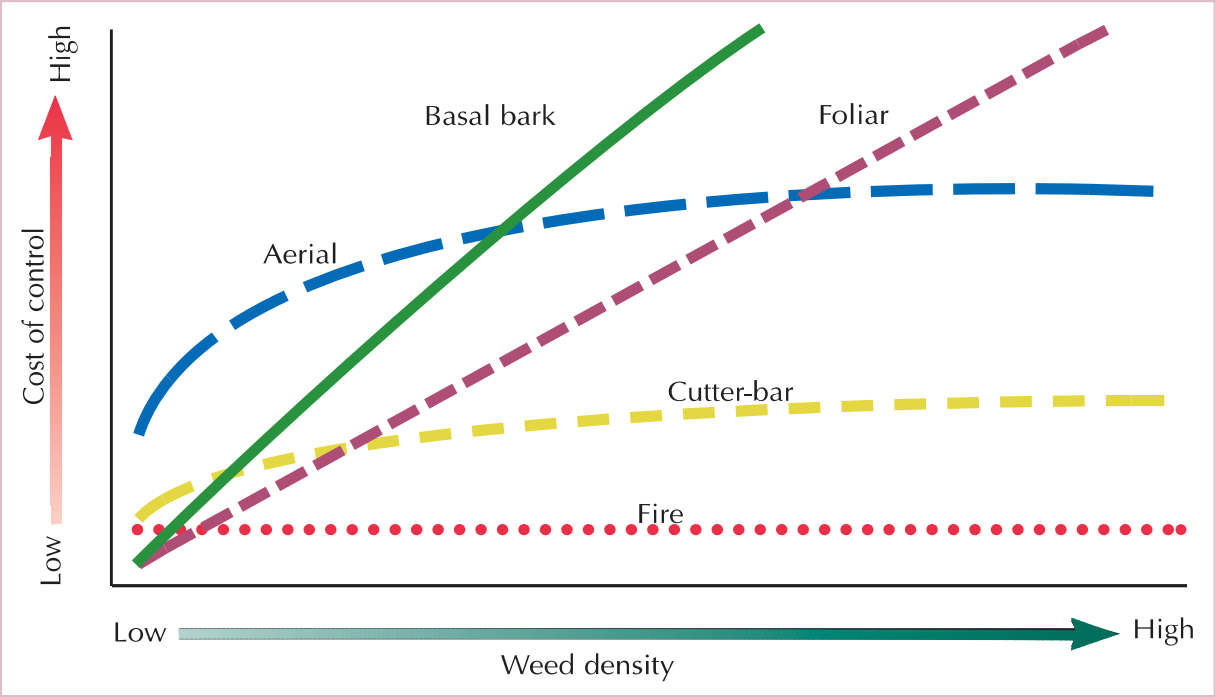
- The easiest way to identify problem areas is by using a map of the property. This can be a satellite image or an aerial or hand-drawn map. The more accurate and more current it is, the easier it will be to estimate and calculate control costs precisely, and to track the long-term effectiveness of control programs.
- Separate transparent overlays are useful when developing maps—one to indicate property improvements, one for vegetation types and natural features, and another devoted solely to weed infestations. Using different overlays can make each section of the map easier to interpret and can also be helpful when making management decisions (e.g. determining the best place to put fences).
- On the map, outline all natural features, improvements and property boundaries; then indicate areas of rubber vine, noting the size and density of each infestation.
- Prioritise the areas for control or eradication at the property level and at a paddock-by-paddock level, keeping in mind features outside the property such as seed sources, seed dispersal routes or vulnerable areas.
- Consider what legal or ethical responsibilities you may have (e.g. the threat of rubber vine to neighbouring properties).
- Consider relevant local government, catchment or regional priorities and plans.
- To help prevent infestations from spreading, focus initial control efforts on isolated outbreaks. A good rule of thumb is to start with the section that will be easiest to control and then gradually work towards the thicker patches.

Step 2: Determine the control options

- Identify what resources are already available or affordable, such as spray equipment, machinery and labour. This will indicate which control methods will be the most economic and beneficial.
- Decide which methods will be required at all phases of the program—initial control, follow-up and ongoing monitoring.
- As there is now a comprehensive range of methods available for rubber vine control, decide which will be most appropriate in the given situation. Figure 1 is a guide to the cost efficiency of different techniques in relation to infestation size. It is usually necessary to use a combination of methods to complete the job effectively (see p. 14).

Step 3: Develop a financial plan

- Estimate the cost of the management strategies and control options for each priority.
- Evaluate the costs of the chosen methods in relation to those of other operations currently occurring on the property to ensure they are economically viable.
- Integrate these costs into short-term and long-term property budgets.
- Find out if there are any financial incentives available to assist with control programs.
- Consider all costs (including the hourly running costs of machinery and labour). If necessary, seek advice from local government or departmental weeds officers before committing a large amount of money.
- Take into account the cost of future control—this is frequently underestimated.



▲ Figure 1 Cost comparison of rubber vine control techniques.

Step 4: Schedule activities

- Consider how effective various control methods will be at different times of the year and balance this with the time available for carrying them out.
- Try to integrate weed control with other property management activities (e.g. combining a routine burn with the control of rubber vine).
- Schedule any weed control activities for the year.
- Make rubber vine control a regular part of property management. When developing a plan, allow for monitoring and follow-up after the initial treatment, and ensure that follow-up occurs within a year.

Step 5: Monitor progress

- Monitoring should be an integral part of any control program. It can be used to check how a treatment worked, to identify areas of regrowth and to find out where follow-up is required.
- Use the map of the property as a starting-point record of the problem before any control work has commenced.
- On the map, show any new or previously treated areas of infestation.
- To show any changes resulting from control work, take several photographs from the same point over time.
- Document control costs and resource requirements.
- Incorporate monitoring activities into the yearly timetable.

Step 6: Follow up what was started

- As no control method for rubber vine results in 100 per cent kill and because some regrowth is almost guaranteed, follow-up control is crucial.
- From the monitoring sites, identify areas where follow-up is needed as a result of regrowth or seed germination.

Helpful tips

- As there is no 'quick-fix' for rubber vine control, developing a management plan and committing to it are essential for the long-term effectiveness of your efforts.
- Any control plan is useless without implementation. If (because of the size of the problem or the lack of experience) it is difficult to start planning, it is advisable to seek professional advice and/or to start on a smaller scale.
- While the plan must be structured, it should be flexible enough to allow for changes brought about by uncontrollable external influences such as drought and fluctuating commodity prices.
- The plan must be reviewed annually to assess the effectiveness and efficiency of the control options and strategies implemented.


CAN'T SEE THE FOREST FOR THE RUBBER VINE?...
AERIAL MAP
RUBBER VINE LOCATION
SOIL DISTRIBUTION
OUTSIDE INFLUENCES
BURNING PATTERNS
FENCES STRUCTURES
MACHINERY USE
NEIGHBOURS
LOCAL GOV'T
CHECKPOINTS
SPRAYING
LEGAL ISSUES
"... IT ALL DEPENDS ON HOW YOU LOOK AT IT!
TRANSPARENT OVERLAY PLAN

section 3

The toolbox

Section 3

The toolbox

Control methods

Control of weeds such as rubber vine is problematic because there is no single, simple approach that is completely effective.

Factors that must be considered include:

- the size and density of the infestation
- its location in relation to other rubber vine outbreaks
- its accessibility
- the preferred method for applying chemicals
- the resources on hand
- the presence of non-target species
- the life cycle of the plants
- the time of year
- the features of the landscape (e.g. slope, waterways)
- the side-effects of control (e.g. bare soil after treatment).

To achieve the desired outcome, it is important to consider how cost-effective and practical the chosen methods are. As the objective is not just to kill rubber vine, but to regain good pasture and healthy trees, to increase production, and to protect native plants and animals, the effect of control methods on the growth of other plants and on the soil after the rubber vine has been killed must be taken into account. Establishing good pasture cover soon after removing rubber vine will minimise the risk of erosion and may help to reduce the risk of invasion by other weeds.

The use of fire, biological, chemical and mechanical methods of control are outlined on pp. 16–29. It is common for land managers to trial various methods and assess the results in a particular situation and, in effect, learn by experience. Instances of this are described in the case studies where several landholders discuss how they have tried different approaches, have adopted some for wider scale control, have modified some, and have abandoned others.

In nearly all cases, a combination of methods has been used. A common practice is to use rubber vine rust to weaken the plants; fence areas to control stock rates and manage the fuel load; burn off next with a series of fires; and finish with chemical control to eradicate remaining plants. Such an integrated approach takes advantage of the strengths of the various control methods and is efficient in achieving the desired result.

Effect of plant density

The density of plant infestations has a major influence on choice of control method.

Low density

- Low density infestations have a minimal effect on the environment, but there is still a real threat of spread or expansion of the range of the pest.
- There are many cost-effective options available for control at this stage, however scouting to locate infestations may be time consuming.
- Control methods should be chosen according to soil type and topography.

▲ Low density.

Medium density

- Medium density infestations have an increased effect on pasture and the environment, and result in decreased production.
- Several cost-effective control options are available at this stage.
- Stocking rate should be managed so that sufficient fuel can accumulate; the infestation should then be burnt; and methods appropriate to the land type should be used for follow-up.

▲ Medium density.

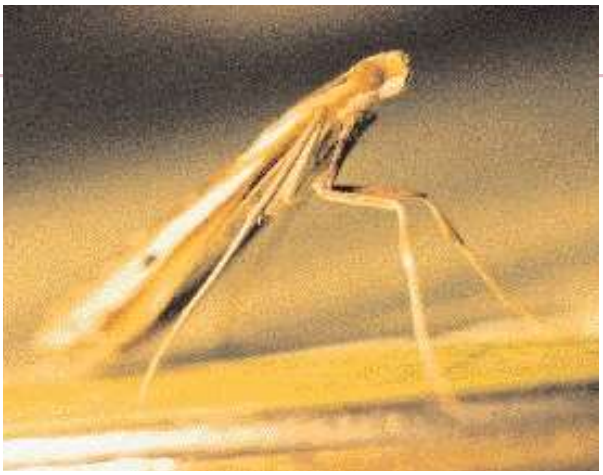
High density

- High density infestations have a high impact on production, management and land quality.
- To stop spread, small marginal parts of the infestation and strategic areas downstream must be prioritised and targeted.
- Infestations should be mechanically broken up into smaller, more workable areas. Fire and biological control are often the only realistic options that are economically viable.

▲ High density.

Biological control

Both the rubber vine moth (*Euclasta whalleyi*) and the rubber vine rust (*Maravalia cryptostegiae*) have become widespread throughout all areas infested with rubber vine since they were released in the early 1990s. Rubber vine moth was released between 1988 and 1991. In the early stages it was found to be quite effective in defoliating large patches of vine, but in recent times a number of factors (including its parasitisation by native wasps) have reduced its effect.



▲ Rubber vine moth (*Euclasta whalleyi).*

Rubber vine rust, which was released between 1995 and 1997, has had a significant impact. It has been found on rubber vine in all areas but is less prevalent in the dryer western areas. It is most effective where temperatures are between 20°C and 25°C, and with conditions that allow for 8–24 hours of moisture daily (from either rain or dew) on the leaf. Under these optimum conditions, it reproduces in 7–10 days. It can reproduce outside these ranges, but at a slower rate.

▲ Rubber vine rust (*Maravalia cryptostegiae).*

Rust infection causes rubber vine to lose its leaves prematurely, and a number of defoliations per season can greatly reduce the reproductive and vegetative growth of each plant.

One of the greatest advantages of using this rust for rubber vine control is its impact when integrated with fire. Tom and Belinda Keats of Gleeson say, 'Rust causes leaf drop, which helps fire and also decreases flowering and seeding'. Rust-induced leaf drop allows grass to grow and produces a build-up of leaf litter, together providing fuel for fires in areas where burning off has previously been difficult.

Rust stresses the plant, reducing the efficacy of foliar herbicides. Therefore foliar herbicides should be applied to rubber vine only when there is little or no rust present. In effect, the rust shortens the period when these herbicides can be used.

The key advantage of biological control methods is that they are species specific. However, as the biocontrol agents currently available for rubber vine slow its progress but don't usually kill it, they must be used in conjunction with other methods to destroy rubber vine.

▾ Rust levels—low, medium, high.

▲ Eight Mile Swamp release site for rubber vine rust in 1995.

▲ By 1999 the Eight Mile Swamp site showed chronic rust infection of rubber vine.

Control using fire

'It's a great thing, fire'—John Teakle of Holmleigh.

Fire is perhaps the most overlooked tool in the control of rubber vine. Burning can be more effective and cost efficient than attacking dense infestations solely with chemical, which requires spending significant amounts of money and time.

Tom and Belinda Keats of Gleeson explain, 'There's a cost too—in machinery, men, breaks, loss of grazing—but it's still cheaper than herbicide. You invest a small amount of country to protect the rest of the country. Also, locking up and burning will increase the productivity of your best and currently invaded and unusable area, and that means increased stock production'.

▲ Fire requires careful planning.

Fire does not stand alone as an approach to controlling rubber vine but should be part of a planned and managed program that includes a number of control techniques and several fires. On some properties, burning may already be a routine part of the property management plan for maintaining balance on grasslands, savannahs and woodlands that have evolved under regular fire conditions.

Preparing and managing the fuel load prior to burning, and following up in a timely manner after the fires are critical in the overall success of the program. In his rubber vine case study, Bob Shoyer says that 'if a fire gets into it, it will kill it, but fire won't get in unless the rust and the grub (the larvae of the rubber vine moth *Euclasta whalleyi*) first weaken the plants and let more grass fuel and leaf litter build up under them'.

◀ Fire is a useful tool when controlling rubber vine.

Important factors to consider when planning treatment with fire:

- What is the desired outcome?
- When is the best time to burn?
- What is the seasonal weather outlook? (Check the Southern Oscillation Index.)
- What fuel load is required? (Remember, the greater the fuel load, the higher the potential for a high intensity fire.)
- Will fencing be needed to manage pre and post-fire grazing?
- Is non-target vegetation likely to be killed? (Large trees exposed to high intensity fires are likely to die. If so, make sure you comply with any state or local government legislation for vegetation management.)
- What safety precautions are required (e.g. firebreaks)? Remember that there are risks associated with fire not just on the day of the burn, but also on subsequent days.
- When will follow-up operations be required?
- Always get a permit to burn from your fire warden, and notify your neighbours.

A low intensity fire is adequate for controlling rubber vine and is cheaper, safer, and requires a lighter fuel load than a high intensity fire. It is also less likely to kill trees and other desirable vegetation.

◂ Low fuel level—burn with wind (front burn).

When considering using fire it is important to take into account the amount of fuel present. If the infestation is dense, with little or no grass fuel, burn when there is as little soil moisture as possible, and a steady breeze. This will help the fire carry throughout the infestation and open up the canopy, allowing grasses to re-establish after the fire.

To fast track the re-establishment of grasses, it will probably be necessary to seed areas where high intensity fires have burnt rubber vine 'towers'. To avoid such high intensity fires, burn rubber vine towers only during moist conditions, prior to a general burn of the infestation.

Less dense rubber vine will not carry a fire from plant to plant but will allow grasses to grow under the canopy. When dry in late spring, these grasses can fuel a fire. In dry conditions with a moderate wind, even fairly thin pasture can generate a fire of sufficient intensity to kill most rubber vine plants. Such a mild fire will have the advantage of leaving a fair amount of viable pasture seed to take advantage of the next rain.

In areas with good grass throughout, burning should take place three days to a week after the first significant rain event of the season (>25 mm). This reduces the risk of losing pasture coverage and reduces the impact of fire on rapidly growing grass; any later after the rain and the grass will be too green to burn.

Too little fuel.

Fuel is too green for a good burn.

More fuel than necessary.

This is a good level of fuel. The fire will carry.

The weather conditions can also be used to control the intensity of a fire. For example, if there is a high level of fuel, burning late in the day will result in a less intense fire than burning in the middle of the day.

If rust has not effectively defoliated the rubber vine, it may help to integrate the use of chemical with fire as a treatment. Applying chemical to rubber vine will open up the canopy and aid grass growth within an infestation, improving the fuel load for the follow-up fire. Note that sufficent time must be allowed for the fuel to build up between the chemical application and the fire.

Clearing tracks through the rubber vine with a bulldozer can also increase the fuel load within infestations. Seeding cleared tracks will encourage growth of grass but isn't always necessary. Once there is sufficient fuel, burning can take place.

It is usual for rubber vine to regrow significantly after the first fire. All this regrowth is usually killed during the second fire a year later. Other control methods can be used as follow-up after the initial burn.

Areas should always be spelled after a fire to allow the grass to recover. An area larger than the infestation should be burnt to prevent cattle from congregating just on the new pick in the affected area when they regain access. If they are allowed to do so, they will reduce both the fuel load for the following fire and the competition between the grass and rubber vine seedlings. Another option to help reduce post-fire grazing pressure from wildlife and stock is to burn another area to provide green pick well away from the rubber vine.

Infestations should ideally be burnt for two successive years then spelled from fire for three or four years. Frequent fires can alter pasture composition, increase soil erosion, lead to loss of nutrients and favour fire-tolerant species that could be other weeds.

▲ Clear tracks in dense rubber vine to improve access and increase fuel load.

July 1999

Fire November 1999

March 2000

July 2000

Fire October 2000

March 2001

▲ Two successive early wet season fires—allows for quick response of grass.

Chemical control

Herbicides can be applied to rubber vine in a number of ways:

- on the leaves (foliar application)
- on the ground (soil application)
- by aircraft (aerial application)
- to the stem and bark of the plant (basal barking)
- to the stump immediately after cutting (cut stump).

Methods of delivering chemicals are outlined in this section. Table 1 lists the chemicals that were registered for use on rubber vine in 2004, and the states in which these registrations apply.

Herbicides must be treated with great care so, before use:

- read the instructions and conditions for use on the label
- consider the possible impact on non-target vegetation
- ensure use complies with state and/or local government native vegetation legislation.

Table 1: Herbicides registered for use on rubber vine

Application method	Chemical	State	Rate	Comment
Basal bark	triclopyr + picloram (Access)	All states	1 L/60 L diesel	Apply to plants up to 5 cm basal diameter.
	triclopyr (e.g. Garlon 600, Invader® 600, etc.)	All states	1 L/60 L diesel	Apply to plants up to 5 cm basal diameter.
	2,4-D ester (Agricrop Rubber Vine Spray)	Qld & NSW	1 L/40 L diesel	Apply to actively growing plants.
Cut stump	triclopyr + picloram (Access)	All states	1 L/60 L diesel	Apply immediately after cut is made to plants exceeding basal bark sizes.
	triclopyr (e.g. Garlon 600, Invader® 600, etc.)	All states	1 L/60 L diesel	Apply immediately after cut is made to plants exceeding basal bark sizes.
	2,4-D + picloram (Tordon 75-D)	Qld only	1.3 L/100 L water	Cut and spray stump of large plants.
	2,4-D ester (Agricrop Rubber Vine Spray)	Qld & NSW	1 L/40 L diesel	Cut horizontally and spray immediately.
	2,4-D amine (500 g/L)[1]	Qld & WA[2]	2 L/100 L water	Apply to freshly cut stump.
Foliar	triclopyr + picloram (e.g. Grazon DS, Grass-up, etc.)	NT, Qld & WA	0.35 L/100 L (Up to 1.5 m tall at flowering) 0.5 L/100 L (Dense stands greater than 1.5 m tall at flowering)	Not to be used if infected with rust. Spray all leaves and stems just to the point of runoff and thoroughly spray the base of the plant.

Table 1: Herbicides registered for use on rubber vine

Application method	Chemical	State	Rate	Comment
Foliar	dicamba (200 g/L)[3] + 2,4-D ester 800 g/L	Qld & NT	0.35-0.7 L/100 L water + 175 mL 2,4-D ester	Apply during April or May.
	dicamba (500 g/L)[3] + 2,4-D ester 800 g/L	Qld & NT	0.14-0.28 L/100 L water + 175mL 2,4-D ester	Apply during April or May.
	2,4-D + picloram (Tordon 75-D)	Qld only	1.3 L/100 L water	Thoroughly wet leaves and also the soil around the base of the plant.
	imazapyr (Arsenal®)	Qld only	0.4 L/100 L water	Apply sufficient spray to wet the surface visibly to the point of run-off. Apply when the plant is actively growing.
	metsulfuron methyl (e.g. Brush-off®, Brushkiller™ 600, etc.)	Qld & WA[2]	15 g/100 L	Apply when actively growing. Ensure thorough spray coverage of all foliage and leaders. Always add a surfactant/wetting agent.
	2,4-D ester (Agricrop Rubber Vine Spray)	Qld & NSW	0.5 L/100 L water + Activator	Activator must be added. Apply when actively growing. Thoroughly spray bushes to point of runoff, wetting every leaf.
Soil[4]	hexazinone (Bobcat® SL, Hexazinone, Velpar® L)	Qld only	1–4 mL/spot or 6 mL/vine or bush	Apply to plants up to 2 m tall.
	tebuthiuron (Graslan)	Qld & NT	1.5 g/m^2 or 7.5–15 kg/ha	Use the higher rate on dense growth or heavy clay soils.
Aerial	triclopyr + picloram (e.g. Grazon DS, Grass-up, etc.)	QLD & NT	3–5 L/ha	Spray from helicopter only. Use the higher rates on dense stands, however, complete coverage and penetration may be difficult. Apply a minimum spray volume of 150 to 200 L/ha. Follow up respraying will be required.
	2,4-D ester (Agricrop Rubber Vine Spray)	Qld & NSW	50 mL/10 L water + Activator	Use raindrop nozzles to reduce drift; minimum spray volumes of 150L/ha; add Activator.
	tebuthiuron (Graslan)	Qld & NT	1.5 g/m^2 or 7.5–15 kg/ha	Use the higher rate on dense growth or heavy clay soils.

Always refer to the label supplied with the product.

[1] 2,4-D amine is also registered for use at different concentrations. Always check the label for the correct rate.

[2] Under permit in WA.

[3] Dicamba on its own is registered in WA (2,4-D ester is not registered in WA).

[4] Do not use soil-applied herbicides within a distance of 2–3 times the height of desirable trees.

Use of soil-applied herbicides must be done in accordance with state and/or local native vegetation legislation.
Do not apply Graslan within 100 m of a recognised watercourse or on land with a slope greater than 20 per cent (11 degrees).

Foliar spraying

Foliar application of herbicide is effective only under very specific conditions, and follow-up treatment is essential. Since the impact of rubber vine rust, the window of opportunity for foliar application has become even smaller and in some areas there may be times when there is no opportunity at all.

For foliar application:

- plants must be actively growing (not stressed)
- there must be little to no rust present as it affects the health of the plant and its ability to take chemical up through its leaves
- plants must be thoroughly sprayed to the point of run-off, wetting every leaf
- follow-up is required
- see table 1 for registered herbicides.

Aerial application

Three herbicides are currently registered for aerial application to rubber vine:

- 2,4-D ester (Agricrop Rubber Vine Spray)
- triclopyr + picloram (e.g. Grazon DS, Grass-up)
- tebuthiuron (Graslan).

As both Agricrop Rubber Vine Spray and triclopyr + picloram (Grazon DS, Grass-up, etc.) are absorbed by foliar uptake, the same conditions as for foliar spraying apply. Refer to the section on soil-applied herbicides (p.27) for more detail on the use of the herbicide Graslan.

As aerial application of these herbicides may result in damage to non-target species, use must be in accordance with state and/or local native vegetation legislation.

▲ Foliar spraying.

▲ Aerial spraying.

Basal bark spraying

Basal bark spraying can result in up to 95 per cent kill of rubber vine plants. Keys to success include:

- applying the herbicide when the plant is actively growing
- using the basal bark technique for stems up to 5 cm diameter, and the cut stump method for plants with stems larger than 5 cm
- thoroughly spraying right around the bark of the plant from 20–80 cm up the stem to ground level (spraying top down). Plants with thicker stems, multiple stems or plants older than four years must be sprayed to a minimum of 60 cm up the stem, and even up to 80–100 cm. For smaller, single-stem plants, spraying from 20–30 cm up the stem to ground level should be sufficient
- removing any obstructing vegetation, debris or soil from around the stem so that enough chemical reaches the plant to kill it, thus preventing reshooting
- keeping spray pressure down and using a nozzle with a directed, rather than a fan pattern—if the spray droplets are too fine and misty, insufficient chemical will reach the plant
- following-up.

See Table 1 for registered herbicides.

Rubber vine killed by basal bark spraying.

Cut stump

Applying herbicide to the cut stump is a very effective way of killing rubber vine. As it is targeted, the risk of killing non-target species is low; it is efficient in its use of chemical; and it is suitable for use along watercourses. However, it is costly in labour terms, and is most suitable for use on scattered plants or plants in small, easily accessible infestations.

To use this method, cut horizontally through the stem as close to the ground as possible and immediately apply the herbicide to the cut surface of the stump.

See Table 1 for registered herbicides.

Cut plant close to ground and apply herbicide immediately.

Soil-applied herbicides

Because of the high risk of killing non-target vegetation, including trees and pasture plants, soil-applied herbicides play a role in controlling rubber vine only in specific situations. It is important to comply with the relevant state and/or local government native vegetation legislation, and it should be noted that causing even accidental death of vegetation can be a breach of this legislation.

In most instances, this method would not be first choice because of the possible environmental effects. It may be appropriate where there is insufficient fuel for fire, the terrain is unsuitable for machinery, and the infestation is too large for foliar or basal bark application of herbicides—provided that the site is the required distance from watercourses.

Two chemicals—hexazinone (Velpar® L, Hexazinone, Bobcat® SL) and tebuthiuron (Graslan)—are currently registered in some states for soil application for the control of rubber vine (see table 1).

Hexazinone is a non-selective herbicide that can kill trees and other desirable plants and may have a residual effect on pasture for 12–24 months after application.

Graslan can also kill trees and must not be applied on slopes greater than 20 per cent (11 degrees), within 100 m of a watercourse, or in areas to be put under field crops within five years of application. Neither Graslan nor hexazinone may be applied where the chemical or treated soil can wash into areas where there may be roots of non-target plants.

An example of successful and appropriate use of soil-applied herbicide is outlined in the case study prepared by Brett and Jenny Epple of Alstonvale (p.56). Part of their property is a stony tableland with shallow soil that does not sustain trees. They trialled Graslan on this section, and have since adopted its use as the primary control method for rubber vine in this situation. They use combinations of other methods elsewhere on their property.

◂ Soil applied chemicals have been effective on Brett and Jenny Epple's property.

Mechanical control

Slashers, cutter-bars, stick-rakes and blade or disk ploughs can be used to destroy rubber vine mechanically. Timing is important—June to September is best, when dry conditions minimise reshooting. A blade plough and cutter bar combination can kill 90 per cent of plants. Slashing is less effective, usually killing about 50 per cent of rubber vine present.

▲ Front mounted blade plough (Ellrott design).

NRM&E's John McKenzie believes that, 'If you stick rake in the dry, then when the conditions are right the rust gets in and knocks the rubber vine regrowth back, so much so that there may not be a need for a second treatment.'

Darryl Knuth of Cameron Downs says that, 'We had always done the stick-raking in the wet weather but after we heard from John McKenzie we did it in the dry and got a better kill'.

▲ Slashing.

Mechanical control is generally not suitable for core problem areas such as densely infested creeks and gullies, but is appropriate:

- where no other method can be used (e.g. in dense infestations that have no fuel load)
- on even country
- on areas free of desirable vegetation or where there is enough room to manoeuvre machinery
- where it is necessary to gain better access to infestations where other control techniques can be used
- where infestations must be opened up to promote grass growth.

As native vegetation may be damaged (either intentionally or accidentally) when mechanically controlling rubber vine, **it is essential to comply with the relevant state and/or local government native vegetation legislation, so check this before starting work.** On Cameron Downs, Darryl Knuth found that a fair bit of timber had to be taken out before the stick-rake could be used properly. He said, 'There was a lot of rubber vine up the trees, which had killed them, but we needed to get a tree clearing permit anyhow'.

Before using mechanical methods of control, consider the impact on erosion and take any necessary steps to minimise the hazard.

Table 2 shows the potential results of using the different control methods under ideal conditions.

▲ Consider the risk of erosion.

Table 2: Comparison of control methods, when used in ideal conditions.

Method	Life stage			
	Seed	Seedling (small plant)	Juvenile (not able to produce pods yet)	Adult (able to produce flowers and pods)
Fire	up to 90%	up to 100%	up to 95%	up to 90%
Mechanical*				
Cutter bar	0	up to 90%	up to 90%	up to 90%
Slashing	0	10%	10%	50–70%
Chemical				
Cut stump	not applicable	not applicable	95%	95%
Soil applied*	kills seedlings as they germinate	90%	90%	70–80%
Basal barking	not applicable	not applicable	95%	up to 95%
Aerial spray	0	95%	95%	70 to 80%
Ground foliar spray	0	95%	95%	95%
Biological control				
Rubber vine moth	0	seasonal defoliation	seasonal defoliation	seasonal defoliation
Rubber vine rust	0	seasonal defoliation, growth reduced	seasonal defoliation, growth reduced	seasonal defoliation, growth reduced

*Do not use soil applied herbicides within a distance of 2–3 times the height of desirable trees.
Use must be in accordance with the state and/or local government native vegetation legislation.

Conclusion

There are many different ways of controlling rubber vine. As no single method is suitable for all situations, planning is the key to identifying the most efficient and economical way to achieve the desired outcome. In the case studies detailed in this manual, most land managers have used a combination of methods. Together with diligent monitoring and follow-up, these have achieved good results.

Case studies

Section 4

Section 4

Case studies

Property management approaches

Does slashing work?

Ray Tapiolas of Sheep Camp Pastoral Company, near Home Hill

There was always a bit of rubber vine on the Sheep Camp property and Ray remembers that after they'd had a few good wet seasons it spread rapidly. He said, 'We should have got onto it then, but time went by and next thing it was everywhere. It was so dense we used to lose cattle in it and we couldn't even walk a horse through it'.

Ray and his brother started spraying the rubber vine along the creeks with 2,4-D. 'That worked well, but it grew back a bit deformed. If we sprayed again, that would roll it. Spraying with 2,4-D was only successful when the leaves were green and, at that time of year, other jobs around the property often took priority. Eventually it got on top of us'.

▼ Ray Tapiolas of Sheep Camp Pastoral Company.

Ray and his neighbour, Bob Shoyer, decided to get in touch with John McKenzie from the then Department of Natural Resources and Mines. John suggested that they do a trial with mowing. 'At that time, about 500 acres (200 ha) of the grazing property was infested with scattered rubber vine and about 100 acres (40 ha) was really thick. The project centred on the thick stuff along the creek and on the flats.'

▲ Ray Tapiolas uses slashing to control rubber vine.

'They came in and mowed it all down. There were lot of stumps but they had a blade at the front of the tractor. I don't know how it didn't wreck the mower—it was a heavy-duty one, but it was hard going ', said Ray. 'It was very successful and the areas that were mowed are pretty well dead. A few small seedlings have come back and one or two older plants have re-shot so I might go and mow it again this year.'

> 'I've found that when you get rid of rubber vine, the grass seems to grow better.'

'Now that it's open, I want to keep it clean. It's ideal for Access. With diesel, Access gives an excellent result, but it takes longer than slashing. 'I've found that when you get rid of rubber vine, the grass seems to grow better. It was bare here, but now look at it—I think that I'll burn it after a bit of rain'.

Ray says that different approaches should be used for different country. 'Slashing on good flat country is okay, but it can be hard on machinery. I'd only do it if someone went in front, otherwise there's the risk of doing a tyre. In the broken country, I'd think of putting a fire through—it's too rough and rocky in there for a tractor. You also run the risk of sparking on rocks and starting a fire accidentally.'

'Rust has helped a lot, but I don't think that it can be depended on to control the spread of rubber vine or existing infestations. Last year it was very dry and after it rained the rust didn't come back for a long time.'

'Everyone thinks rubber vine won't be a pest when they see a bit here and a bit there. But you must get stuck into it early and get someone onto it full time and try to get rid of it. It's pretty hopeless unless you get everyone in the area doing it, otherwise as fast as you clear it, it comes back in again.'

▾ The greater the damage to the stump the better the kill rate when slashing.

Starting to win against rubber vine

Darryl and Debbie Knuth of Cameron Downs, near Charters Towers

There has been rubber vine on Cameron Downs since before Darryl's parents bought the property in 1968. Darryl recollects that about a quarter of it was affected—mostly the best country, the creek flats and all the creek systems.

They confess that they were pretty slow to get started on control.

'If we'd thrown money at it ages ago, we'd be on top of it now. It comes down to priorities. We just needed to get cattle onto the properties—and we had dry weather on top of that. At that time, we also had miners left, right and centre. They dug it up and there's nothing rubber vine likes better than dug-over soil.

'The rubber vine was a real hindrance to property management. It really slowed us down. When we were mustering, we couldn't get the cattle out of it—we needed a heap of men and dogs. And it was dangerous to cattle, men and horses when it strangled or tripped them. We were down by a good quarter of our feed production. It is also toxic to cattle. If you put cattle into a recently burnt paddock and it rains, the cattle will eat the rubber vine shoots and they'll die. I have lost weaners and even bulls to rubber vine', Darryl said.

At first the Knuths tried to contain the rubber vine in the creek systems, but now that they're starting to work on the flats, they are making some inroads.

'In the last 10 to 15 years, since we decided to do something about it, we've really thrown everything at it. We started off stick raking the smaller patches—that was a fast knock over and gave us the use of the paddocks quickly. If you use burning or chemical control, it will take at least two years until you can get stock back in'.

The Knuths stick raked, pushed, heaped and burnt, then seeded the area with buffel grass. 'The stick raking was very good and it only took three to six months before we could get the stock back on, but it was very expensive. After we'd cleaned it up, if we put two decks of cattle into the holding paddock, we could get two decks out, not one-and-a-half, because they couldn't hide in the rubber vine any more.'

'We'd always done the stick raking in the wet weather, but after we heard from John McKenzie, from the Department of Natural Resources and Mines, we did it in the dry and got a better kill.

'John told us that the seasonal effect was very strong—that if you stick rake in the dry, then when the conditions are right the rust gets in and knocks the rubber vine regrowth back, so much so that you mightn't need a second treatment, but stick raking in the wet produces a lot of regrowth.

However, with established rust and decreased reserves, it appears that rubber vine has less resilience to mechanical damage in the dry. 'Stick raking fractures the stems', Darryl commented, 'and fungus gets down into them—rubber vine doesn't seem to be able to resist. We had to take out a fair bit of timber so we could use the stick rake properly. There was a lot of rubber vine up the trees, which had killed them, but we still needed to get a tree clearing permit'.

'There was a lot of rubber vine up the trees, which had killed them, but we still needed to get a tree clearing permit.'

'In the broad acreage areas, we fenced off a few of the creeks and tried to spell them, but it was always so dry that we never had a great fuel load. It's a good idea to fence country out—it reduces the risk of cattle eating rubber vine and dying and helps fuel build up. If the season and the standover grass allowed it,

we'd burn for green pick and combine that with rubber vine and tick burns. It depends on how much fuel we can get in a season. If you have a run of good seasons, you could probably knock rubber vine over in three or four years. We reckon that we've got a good 70 per cent of it gone now, and that's after 10 years. You don't need a great lot of heat to kill rubber vine, but you need grass to carry the fire through—I've seen low intensity fires do a pretty fair job.'

John McKenzie said that research conducted on the Knuth's property indicated that there was no significant difference between the kill rates from low intensity or high intensity fires, but because it cost more to manage the high intensity fires, the cost per plant killed was higher.

'Fire is a good control method', Darryl said, 'but you have to do it in the right way, have the season right and have neighbours in agreement. Cost is variable, and not as cheap as you might think—you need to have resources on hand. If a fire gets out of control, it can cost a lot. Together with fire treatment, the moth and the rust have been a great benefit—they let more grass get into the rubber vine than before.

'For the first two years, the moth did an excellent job, then the wasp started parasitising it, but the rust has come in and knocked the rubber vine about. When they first introduced the rust, it knocked the leaves and flowers off, and then it reduced the seed to only the tips of the pods. Now I'm finding pods with no seeds in them'.

Darryl and Debbie agree that there is also a place for chemical control. Mechanical clearing opens up thick infestations, which can then be treated with chemicals.

'You have to have a clean up every now and again—we had the Greencorps for five weeks. One of us went with them to mix the chemical. We used cut stump treatment, basal bark and foliar spraying. We use AF Rubber Vine Spray or Access and diesel for cut stump and basal barking, and Brush-off® for foliar.

In the early days, Tordon was very good. When it's dry, we use Access, but if it's wet and the plants are growing we use AF Rubber Vine spray.'

Darryl warns that precautions should be taken when using chemicals. 'Access fumes will knock you around a bit.'

> 'If you put cattle into a recently burnt paddock and it rains, the cattle will eat the rubber vine shoots and they'll die.'

The Knuths use a gear pump for water-based foliage sprays and industrial quality eight-litre garden spray packs for diesel-based mixes, which they prepare in a 44-gallon drum.

'Our priority is long fence lines. We try to clear them a bit using cut stump; we use basal barking on ridges where the rust doesn't reach, so they don't seed. In stick-raked country, we do the odd bit of follow-up spray and basal barking, and we use foliar spray for thick patches of young stuff. Chemical is good for cleaning up or using before patches spread too far.'

Darryl and Debbie have also been involved in barter days, and feel that they work well in principle.

'The 70-Mile Range Landcare Group got some Weeds of National Significance (WONS) funding for chemical, and each property agreed to send one or two people. You start at one property and work through each participating property—there were six properties so we had twelve workers.

The property owner controls mixing, distribution and application of the chemical—so it's done how you like it—you're the boss on your place! You work through it, do a full week, and it's finished.

'The problem with barter days is that it's a totally chemical program—it's good for cleaning up fired or mechanically cleaned country, but if you're working down a creek and hit a thick patch, it's like hitting a brick wall, you've no hope of spraying it.

'We'll see when it rains! We have a pretty good Landcare group here; we all agreed that we were going to do it and we were committed to it. I'd estimate that we put out about 1000 litres of mix per day per property. The good thing about having so many people involved is that you can see the country that you've covered.'

In a perfect world, Darryl would look at seeding as he controls his weeds.

'Now we're getting rid of rubber vine, castor oil and bellyache bush is coming up—we burnt it last year but the seeds came up and there isn't enough grass for a fire this year. The last couple of dry years have snookered us. We can't burn the six-inch-tall plants and we can't sow grass seed.

The Knuths recommend developing and working with a weed management plan for the property. This can help keep the weed control program up-to-date and responsive to changed circumstances, and will help in choosing and refining weed control methods that will work in your area.

April 1999

Stick-raked November 1999

Basal barked April 2000

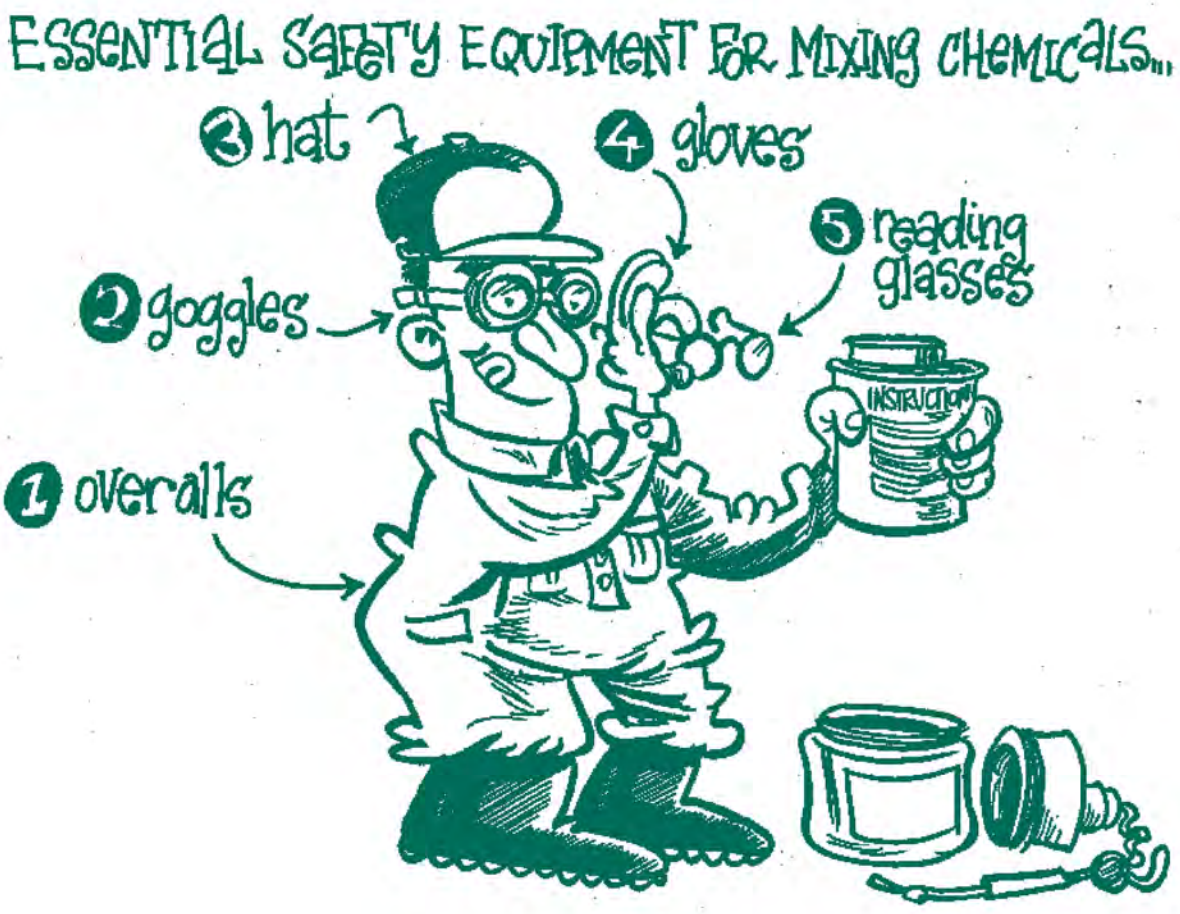
August 2000

April 2001

September 2001

▲ The integration of stick-raking, with basal bark follow-up had a good result on Knuth's.

'If you have a little bit of rubber vine, get stuck into it now—it'll save you money in the long run. Do it when you've got the time. Work with the seasons—they can help you or go against you, but beware—after you think you have rubber vine under control, you should watch out for the next weed!', said Darryl.



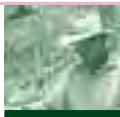
Chemical use and mixing

How chemicals are mixed can make the difference between a successful and profitable operation and one that is uneconomic. If the mix is not strong enough, the kill rate will be reduced and some or all of the job will probably have to be done again. If the mix is too strong, it may kill the outside cells of the plant and prevent absorption of the chemical into the sap system. In the long term, particularly with non-woody weeds, using a mix that is too strong can lead to herbicide resistance and is, at the very least, unnecessarily costly.

The main points to be observed are:

- Read the label and keep the MSDS* nearby when applying herbicide.
- Observe all recommended safety precautions.
- Wear face and eye protection when mixing chemicals.
- Wear gloves and aprons when mixing chemicals.
- Wear overalls, gloves and eye protection when spraying herbicides.
- Wash hands after mixing and using herbicides.
- Wash hands before smoking or eating.
- Mix up only the amount that is required for the day.
- Measure chemicals, diesel and water using calibrated containers.
- Use a wetting agent or other additive if recommended.
- Fill the tank about two-thirds full, add the chemical concentrate, and then continue filling.
- Make sure the chemical is thoroughly mixed into the water or diesel.
- Use a paddle or mechanical agitator to keep the solution in suspension.
- Dispose of unused mixed herbicide and used containers appropriately.

**MSDS: material safety data sheet—obtainable from the chemical distributor and supplier or online.*



Developing adaptive management

Bob and Betty Shoyer of Balanda Park, near Home Hill

For as long as they can remember, Bob and Betty say there has been rubber vine in the gullies and creeks at Balanda Park. Bob recalls, however, that it first really became a problem about 25 years ago, when it started spreading from the creeks to the flats. He estimates that, at its worst, rubber vine covered about 150 acres (60 ha) of the 7500 acres (3000 ha) that he uses for grazing, and on about 90 acres (36 ha) it was so thick that it was impossible to walk through it.

Bob doesn't remember any particular event that started its spread, although a series of floods could have been responsible for dispersing the seed. He thought the problem might have begun when he and his sons were spending time and money on developing their cane farm and neglected the rubber vine.

As the thickets spread and became denser, Bob realised that he was losing feed and having difficulty working his stock.

'Eventually, we saw that we couldn't let it go any further and decided to see what we could do about it. At first we tried clearing and spraying. We used a ball and chain—but that proved to be a disaster. A lot of timber and debris was left lying around, making it easy for seeds to germinate'.

> 'In drought years, when you want to keep feed, you're better off to basal bark than to burn'.

Some of the rubber vine was killed, but many roots and plants were left. According to Bob, pulling is very expensive and he wouldn't do it again. However, he says that if you do pull, you've got to spray the following year when there is green cover. The Shoyers also tried spraying scattered rubber vine plants with an over-the-top spray.

About five years ago, Bob and Betty began to worry about the cost of stopping the rubber vine. At that time, John McKenzie, from the Department of Natural Resources and Mines Tropical Weeds Research Centre, wanted to test different control options for the region and monitor the results of using fire by comparing January, July and September burns.

◂ Rubber vine on Balanda Park.

The overall aim of the project was to set up adaptive management sites using different proven control methods or to develop new ones that would best suit environmental and group needs.

A number of neighbouring property owners in the Leichhardt Downs locality had previously approached the Burdekin Shire Council for information about rubber vine control. When John was looking for a group of landholders for his project, Merv Pyott, the Burdekin Shire Land Protection Officer, recommended this group.

'During the initial meetings', Bob said, 'some attendees decided that as the grub (the larvae of the rubber vine moth *Euclasta whalleyi*) and the rust appeared to be working well, rubber vine was not such a problem, and they chose not to have any further involvement in the project.'

Over three years, John McKenzie observed that there was a considerably high death rate in the rubber vine that was growing away from creeks and gullies. He attributed this to rust infection, dry weather and grass competition. He also observed that though the rust had less impact on rubber vine that was growing in the better conditions in the creeks and gullies, it did defoliate it, putting it under stress and making it more susceptible to fire than uninfected rubber vine.

'In my opinion', Bob said, 'it looks as though fire, in conjunction with rust and the grub, is the best option. It's the most economical way of clearing rubber vine. If a fire gets into it, it will kill it, but fire won't get in unless the rust and the grub first weaken the plants and let more grass fuel and leaf litter build up under them.

'There are instances where herbicides are necessary, for example, we have a couple of areas where the vine is too thick to allow the growth of grass needed as fuel for fire. So we spray and try to get a bit of grass growing and hope that the rust and grub can then thin it enough to carry a fire—although the drought of the last 24 months hasn't been conducive to growth of the rust or the grub.'

Bob intends to spray these areas with AF Rubber Vine spray at 0.5 L to 100 L water.

'As long as it's growing vigorously, otherwise it'll be a waste of time. Basal barking can be done any time, but April and May are the best months for foliar spraying—that is, if you get a decent wet season.' Bob has also tried slashing the rubber vine on some of his flats. 'I got a bit of a result, but I'm not a great believer in slashing unless you can spray 2,4-D on the stumps straight after.'

A slow fire gives a good kill and is easier to manage.

'It looks as though it will take three lots of burns over a period of six years to get on top of it, but it can be a bit difficult when you're trying to save feed over drought years, and you may not get that burn in as you'd like it to happen. In fact, in drought years, when you want to keep feed, you're better off to basal bark than to burn', Bob says.

'If a fire can be started in dense stands of rubber vine, green plants will burn and result in a hot fire, which will open the country up to grass development'.

'The best sort of fire is a hot slow one, as it gets heat into the soil, killing the roots, and gives the trunks a good sizzling. In theory, it's best keeping cattle out for a good couple of years so the grass can build up and fall and put a good fuel load on the ground, if you can work it that way. If a fire can be started in dense stands of rubber vine, green plants will burn and result in a hot fire, which will open the country up to grass development.'

John McKenzie says burning infested areas in the early wet season (October to January) within a week of the first good fall of rain (>25 mm), and before the grass is actively growing, will minimise damage to pasture. Early wet season fires that are intense enough to kill a good percentage of rubber vine plants are easier to manage than hot, dry burns. He recommends burning the whole paddock and resting it from grazing for six weeks to three months after the fire, or at least burning more than the infested area to help reduce post-fire grazing pressure.

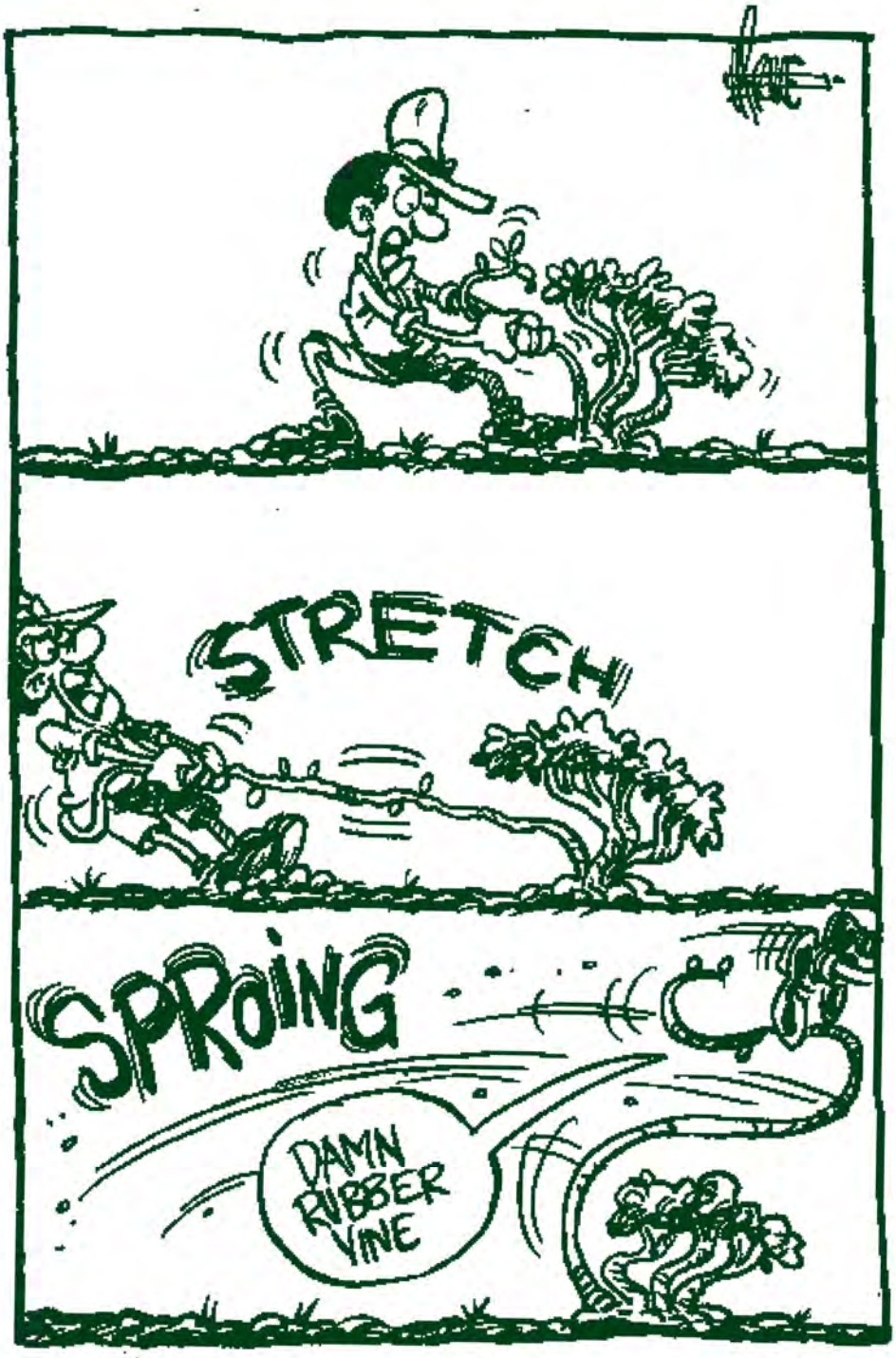
Even if the burn is not carried out immediately after rain and the grass is still quite green, it is still possible to kill about 40 per cent of the rubber vine, but this may have an impact on the grasses.

Bob agrees that it is difficult to get a perfect burn, but thinks that he is a little too cautious. 'The biggest risk with fires isn't on the day of the fire, because then you're prepared with people and equipment, but two or three days later, if it re-lights and there's a bit of a willy-willy. The best time of year to burn is probably May and June, but once you've burnt a patch you're probably not going to get any feed on it for 18 months.'

Even after the third fire, Bob expects that there will still be some surviving rubber vine plants, or ones that will regrow from live roots. He intends basal barking these with Access at 1 L to 60 L of diesel, rather than burning much-needed feed.

'Sandalwood country', Bob says, 'just will not carry a fire—we need to spray over the top with a jet spray from a tractor-mounted unit, and then pick up any stragglers with basal barking'.

Since he started burning and winning the battle with rubber vine, Bob has noticed that Indian couch and seca have spread into the previously infested areas. He hasn't noticed any ironbarks or gum trees dying as a result of his rubber vine control fires.


STRETCH
SPROING
DAMN RUBBER VINE

Get rid of it and improve productivity

Tom and Belinda Keats of Gleeson near Cloncurry

'To be honest,' said Tom, 'I know next to nothing at all about rubber vine, I'm just having a bit of a go at trying to get it under control on Gleeson and to stop it spreading. We've been pursuing rubber vine for years, just trying to keep areas open so we can walk cattle through. This is one of the first serious attempts we've made at actually trying to beat it. I'm concerned that it could move downstream.

'They say there was a big flood here, before I came, about 1974, I think, that brought all the seed in. They reckon horses got stuck in it down here—it's horrible stuff. Cattle get pretty cunning in it and it restricts access for stock getting into water. It's terrible for erosion too, where there's heavy cover no grass grows—and it grows on riverbanks on alluvial soil that's susceptible to erosion. Normally, grass cover forms a mat near the river, but where there's rubber vine, there's 10 metres between plants and no grass in between. In a flood, the soil just washes away.

'Gleeson is 186 000 acres (74 400 ha) of gum and ti-tree country, and about 1000 acres (400 ha) of it are under rubber vine—some of that is accessible by cattle. Soon after I came here, we cleared a track about 300 m wide through it so we could walk cattle through. Access is essential—we have to clean it up! You can drive through there now and see that it's got a good thick store of grass—infested areas haven't got much grass.

'We have a four-wheeler with a spray tank. We used to have all the men doing one week a year on rubber vine. All this did was hold the spectre at bay. By stopping it from spreading, we would have helped things, but we certainly weren't beating it. Some people say that it's not a problem, but maybe that's because they think they can't control it. It gets to a stage where you feel responsible as a landholder—responsible for keeping the land healthy.

◂ Rubber vine on Gleeson.

'We got NHT [Natural Heritage Trust] money and that's what we're using for this year's program. We were successful in getting funding for prickly acacia, mesquite, rubber vine and parkinsonia the first round, but we didn't use all our funds last year because of the season. Rubber vine and parkinsonia are our main weeds.

> 'It gets to a stage where you feel responsible as a landholder—responsible for keeping the land healthy.'

'Fred Shephard, my neighbour at Boomarra, has been onto woody weeds since I started here. With NAPCO's backing, Fred was the main push. To access the NHT money, we made our WONS [Weeds of National Significance] submission as a group—the Upper Landsborough Group. The group works really well because of company backing and because of the involvement of NAPCO's environmental manager, Delphine Bentley—having her as our leader has kept us moving along.

'The group—ourselves and Boomarra and Coolullah—gave me the job of researching a few ideas. I'm not any sort of an expert or anything—come back in five years and ask me, I might know something then! I've made a sort of trial up at the horse paddock and in some holding paddocks. I used AF Rubber Vine spray and Garlon 600. I want to pin down their properties to kill, just mixing them at the normal dose for basal barking. The AF Rubber Vine spray was certainly good, and the Garlon 600 is good too. I've also been using Access for a number of years, and it's certainly the easiest to use.'

Tom also wants to find out how rubber vine reacts to fire in the southern Gulf country. 'We've started on a patch on the Leichhardt and we've burnt enough to test the theory. We got a hot dry fire—there'd been a few storms, but there was not a lot of fuel. The rubber vine was growing well—it probably had about a quarter of its foliage. Green rubber vine burns well because of the latex in its sap. The fire went all right considering how dry everything was. I didn't want a real gory fire as it might have got away on me.

'We didn't put a break around it—fires burning old rubber vine are initially very hot, but it's pretty well impossible to put breaks around them. To do it, you need to spend a day cutting it and another day burning it back, and it can still get away. The cattle couldn't access the fuel load inside the area to be burnt because the rubber vine was way too thick. There was also a fair bit of leaf fall from the drought. It's a natural cycle—rubber vine grows from inside out so you get dead vine and leaf matter on the inside.

'The best time for a burn is earlier in the year—October for example—but that's just too dangerous, the likelihood of the fire getting away is too great. We burnt in December, about the 20th. I left it so long because that country is all sloping so it's susceptible to erosion. We grazed it down pretty well—gave it a bit of a flogging to get grass shoots. The fire still surprised me—the rubber vine goes up trees and it can send sparks a long way.

'You have to do follow-up on burnt areas too. In about '88 or '89 we had a really hot fire on the Kamileroi boundary. I didn't do enough follow-up—it certainly knocked the rubber vine around for a few years, but it's come back with a vengeance now. Some of the thickest stuff now is where we burnt 10 years ago. About four miles down there was a hot fire, and rubber vine germinated along the creek afterwards. 'This time I reckon I'll start with maybe one or two fires first then follow up with chemical.

'I'm also planning to burn the holding paddock. The thick patch will carry a fire but the scattered areas won't. I might not stock it after the wet and see what comes up. We'll do our best with one fire and see what grass comes back. The trouble is whenever you get grass shooting, the roos and wallabies graze it off. When we remove rubber vine clumps with fire we'll see how the grazing goes, and see if we can burn or if we should spot spray'.

'You get a high kill with fire—up to 95 per cent. There's a cost too—in machinery, men, breaks, loss of grazing—but it's still cheaper than herbicide. You invest a small amount of country to protect the rest of the country. Also, locking up and burning will increase the productivity of your best and currently invaded and unusable area, and that means increased stock production'.

Although Tom recognises that rust isn't a cure-all, he says that it is helping their control program. 'Rust causes leaf drop, which helps fire and also decreases flowering and seeding. We first got some rust from Mt Surprise and then from the Burdekin. I introduced it here about five years ago, but I thought it didn't make the trip—six months later, it seemed to be spreading. There was a big wet in 2000, and the rust got ahead, but it seems to die out every year. After the first rains, the plants respond and that's when we rush around burning. I think the rust is helping a bit, but I believe this country is too marginal—it dies back too much in the dry.

'Rust causes leaf drop, which helps fire and also decreases flowering and seeding.'

'If the fellas see a plant somewhere during the course of their day-to-day work, they report it, and we're always keeping an eye out for rubber vine in the outlying areas. This is productive country—rubber vine grows out about 500 m from the river on the river flats. I reckon we can improve our productivity by getting rid of it.

'Rubber vine would break you if you tried to get in and control it with labour, but the government funding is an incentive, and the rust is a help. Even when we've hit it all with poison, that won't be the end of it—there'll still be some plants that haven't died, and suckers and seedlings will come up for a number of years. We'll use contractors to get it initially, and we'll do the maintenance ourselves.

'We can't consider eradication when all the tools we have are rust, leaf drop and fire, but if you've only got a little bit of it, you definitely have to do something about it.

'This is rich alluvial river country, and it'll grow anything with water—that's why I want to get rid of the rubber vine—it's on our best country. In a year when there are good rains, there's potential for a lot of feed—but the area of rubber vine spreads too. I consider rubber vine pretty easy to kill, it's just a matter of doing it. If we don't keep on top of it, it will take over.'

Research and development of biocontrol agents

Biological control can be an alternative to mechanical or chemical control of pest plants. Use of biocontrol agents can complement other methods by decreasing plant vigour and competitiveness, controlling outlying populations, or decreasing flowering and seeding of pest species, and is thus an important part of integrated pest control.

The development of a successful biocontrol program is a very lengthy and expensive process. The program for prickly pear, for example, took many decades to develop. Though hundreds of organisms may be found on a plant, only a few may cause it any harm. As selection is based on ecological safety and environmental suitability, though researchers may have numerous potential agents from which to select, their options may be very limited, or they may find no suitable insects or pathogens.

The technique used to research and develop biological control agents in Australia involves looking for host-specific insects or pathogens in the countries where the weed originated. To ensure that potential agents will not attack native flora or economically important plants when released in Australia, they undergo preliminary testing against target and non-target plants while still in their country of origin.

If these initial tests are successful and the agents show promise as biocontrol agents, the researchers apply to the Australian Quarantine Inspection Service (AQIS) and Environment Australia (EA) for permission to import the selected insects or pathogens into Australia for further, more comprehensive host tests in an approved quarantine facility. If these tests show that the agent is definitely host-specific, scientists then make an application to AQIS for approval to release it in Australia.

Approved agents are then mass reared to produce large numbers of individuals for distribution throughout the range of the weed. Because these agents are introduced without their own parasites and diseases, and often into vacant ecological niches, population explosions can occur, resulting in effective biological control. Once established, agents should be self-supporting, require little further management, and provide a long-term response that is both environmentally friendly and cost effective.

Protecting the Channel Country

John and Bub Teakle of Holmleigh, near Tower Hill

John and Bub Teakle have been managing Holmleigh on Tower Hill Creek for 14 years. Holmleigh, a 15 633-hectare property running 600 head of cattle is 75 km south of Prairie in the Desert Uplands of North Queensland. It is undulating and slightly broken country carrying open woodland with ironbark, red gum, bloodwood and a bit of paperbark on the creeks. The soils are mostly sandy with a few outcrops of rock and hard patches.

'There was a bit of rubber vine here when I first got here, but I didn't take much notice until SWEEP came in, in 1992. That opened my eyes to it! The infestation starts at Jireena next door and goes through to Tyree on the Torrens Creek Road. It's about 50 m wide and follows Tower Creek for about 9 km.

'The density of the infestation varies. It comes in islands, I suppose you'd say, because you get pockets of sand in the creek where seed builds up and it goes from there. I suppose it holds the islands together. Grass *does* grow when the canopy opens up—so does parky (parkinsonia). As you get rid of one weed, another grows in its place.

'The cattle hide in the rubber vine when we're mustering—once they know it's there, they'll look for it. We have ultralights for mustering, but rubber vine makes it hard for spotting.'

▲ Infestation at Holmleigh.

According to John, Trevor Mitchell from the local DPI office, who had started a Landcare group, was responsible for starting the control effort. Trevor 'saw what was happening and organised for the SWEEP team'.

John said that the team did a good job of foliar spraying the small accessible areas of vine, but they were unable to treat the heavier infestations in the creek because they couldn't get right into them. He believes that a follow-up treatment would have been valuable. 'The idea was to break the back of it, then leave it to us, but it was still too big a job for us to take on. If they could have come back a couple of years later, it would have made all the difference.

'After they finished, I burnt any patches that I could. Burning gives you access and thins it out. Burn any time you can get a fire to start and it's safe to do so.'

John explained that you need dry material and debris at the base of the vines to get a fire started, then 'it'll burn up through the green stuff and kill it—the heat seems to knock it around pretty badly.'

He added that this can be a problem in fast-running areas of a creek because 'though debris gathers at the bottom of the rubber vine in the dry, this is not the right time of year for a fire. When it is the right time, the creeks are running and the debris has been washed away—then there's nothing except stalks to burn.'

John added that trying to build up fuel by fencing the area off to let the grass grow isn't effective either because 'with rubber vine canopy, the grass won't grow so there's nothing to burn—and you can't keep the pigs and roos out anyhow—if there's feed they'll be there.'

'We just went through and found the parts we could burn, anything that was too sparse we had to leave and come back later and poison or whatever. The main thing is the country around it—be certain the fire doesn't burn anything around it. If you've got green feed, that's well and good but otherwise you've got to take care with fire.'

'We had another scheme—NHT. They cut stumped anything over 30 mm diameter. They used Access and also AF Rubber Vine spray. The AF spray is just as good as Access—it goes on the same, but there's a big difference in cost. We use Access now because you can use it on parky at the same time, whereas AF Rubber Vine spray isn't registered for parky.'

John said that though the team did a reasonable job, the rubber vine was still pretty dense, and there was still more left than he could handle alone. The team had treated areas that he had burnt previously because this had made access to them easier. There was a lot of fresh young rubber vine in them, interspersed with large vines. As the seasons were quite good at that time and these plants could 'get away', John said it was important that they treat them again.

'We did a bit more burning, and we've just had another go with NHT funding. I did some myself. Because of the spread, we decided to get contractors in. We paid for them—the chemical and diesel were provided by NHT.'

John was satisfied with the work of the contractors who guaranteed a kill and also treated parkinsonia as they went along. He said, 'It's not a fun job—you have to be dedicated to do it. Doing it properly can make or break it.'

▸ John Teakle inspecting control activities.

'They put out 1100 L on the first day and 3600 L in three days—eight people for three days did about half the area on Holmleigh. There was going to be four people here and four on the top, but we ended up using all eight at once—otherwise too many plants might have been missed. Also, we cover more country and we can see where we've been!'

'It was done in September or October 2002. They started a bit late, but it appears to be a good kill. You couldn't walk through it before. There's still a few little areas that need tidying up, but I can come down on the four-wheeler and fix them up. I'm happy with the contractors; they are thorough. They got about halfway through—we'll do a pretty good job of finishing it off as soon as it rains. Hopefully, we'll get back to a stage where I'll be able to keep on top of it with fire and spraying the little ones.'

John's experience highlights the importance of approaching rubber vine management on an 'infestation' level rather than a property by property one. However, he still advises anyone who's got an infestation, no matter how small, to get rid of it immediately.

John said that it was hard to coordinate control between neighbouring properties. 'Some people say that they could live with it while others say it's too big to tackle alone. In the Desert Uplands, biocontrol doesn't work as well as it does on the coastal lowlands.

'Rust is a lighter side of managing infestations but it's too dry out here, and the vine isn't thick enough to keep it going. [Low] humidity is the biggest problem—there's not enough to keep the rust alive.

We had that grub (the larvae of the rubber vine moth *Euclasta whalleyi*) too, chewing away, then we had the water through, and it went away. It has come back since, but not as heavy as before—they tell me that there's also a wasp that attacks the grub.'

John explained that controlling rubber vine on Holmleigh wasn't going to bring immediate gain—caring for the land was the driving force. 'This is the top end of the Lake Eyre Basin—this is where control should be started to protect the Channel Country' he said. 'It's going to take a long time to see the benefits of the money we're putting into it—we'd like to clear it up just so it's gone.'

'We try to impress on anyone in the Landcare group that no matter how little you've got, get rid of it—it might be little now, [but clear] it while you have the chance. You see the seeds floating around when the pods burst—it scares you. Don't be shy to spray with chemical. If you don't kill it first time around, you have to go back. If you can't afford to spray, hit it with a fire and at least thin it out—that'll cut back on the amount of seed set at least.'

Establishment of an insect biocontrol agent for rubber vine

In 1985, researchers from Australia initiated a program to find biological control agents for rubber vine in its native country, Madagascar. Few potential agents were identified. Those found and imported into Australia for further testing included a leaf-feeding caterpillar (*Euclasta whalleyi*), a mealybug *Steatococcus* sp. and a leaf-feeding hawk moth *Nephele densoi*.

The rubber vine moth (*Euclasta whalleyi*), which has a leaf-eating caterpillar, was identified as an agent with good biocontrol potential and sufficiently host-specific to release in Australia. In 1987, the insect was collected from five different sites on the west coast of Madagascar. A mass-rearing program was started in 1988 and between then and 1991 over 115 000 insects were raised for release in Queensland.

Twenty-five sites on four river catchment systems with climatic conditions similar to those in the insects' home range in western Madagascar were chosen as release sites. Fifty-four releases were carried out between 1988 and 1991 and though it was expected that *E. whalleyi* would independently disperse from these points, there had been very few sightings of the insect and little evidence of damage to rubber vine by 1991. It appeared that the insect had failed to establish.

In 1995, however, there was a localised population explosion of *E. whalleyi* in the Charters Towers area. In 1996 it was also found after inspections at each of 74 sites with major rubber vine infestations. Populations also occurred west of the rubber vine containment line and in areas where a few rubber vine plants remained after chemical or fire treatment. Occasionally, it was present in populations large enough to have completely defoliated the vine.

There are indications that the moth may occur in very low numbers for long periods, followed by outbreak populations. As insects have been found over 200 km from release sites, it is believed that they have good dispersal and host-finding capacity. They can also find individual plants and sparsely populated and remote sites. Climatic modelling suggests that they can live wherever rubber vine grows, and should spread independently to contribute to the control of the weed.

Life's certainly better without it!

Greg and Carole Ryan of Green Hills, near Georgetown

Greg Ryan's parents bought the northern one-third of Green Hills, 30 km south-west of Georgetown, in 1968. They bought the other two-thirds south of the Gilbert River in 1976.

'It's undulating country, with a fair bit of granite rock, alluvial creeks and river flats, which have timber, mostly bauhinia, Georgetown box, gums and ironwood, but it's affected by rubber vine', Greg said. 'We inherited the rubber vine problem—we couldn't see how we could beat it—so we just let it run over the top of us, I guess. I'd say that there were about 3000 acres (1200 ha) of rubber vine along the creeks and gullies and on the good river flats—mostly on the creeks carrying into the river, rather than on the Gilbert River itself. The worst patches were on the north side of the river. I don't say you need to be a pig to get through it, but it would help!'

▾ Greg Ryan of Green Hills standing in an area that has been recently cleared of rubber vine.

Greg believes that the rubber vine was brought to Green Hills by miners in the late 19th and early 20th centuries.

'Georgetown was a big goldmining area originally—I'm sure that's where the rubber vine came from, and it's spread and got worse since then—the other side of the river heads up to where a lot of mining was done.'

'The rubber vine makes handling of cattle more difficult and expensive. Mustering is down because they hide in the rubber vine, it's as simple as that. The other thing is that when cattle eat it, they really hook into it. Around October or November, if they've eaten a fair bit of it and you try to handle them, they'll die. It could be something to do with their heart; they don't have to do much, just trot a couple of hundred metres and then they fall down. I've never seen one get up after it's fallen. We've even called off a second muster round here because of it.'

The Ryans really thought that the rubber vine was going to engulf them and that there was nothing practical that they could do to tackle it on a large scale.

'Our saviour was the introduction of the rust—it turned up here in 1995 or '96. I'd done a little bit of basal barking just around the house and the horse paddock when I saw it. I think the rust is stopping the spread of rubber vine, and [contributing to] its mortality. Very little viable seed gets to the ground because of rust; it also makes the vine easier to burn. It kills the ends of the rubber vine plant, makes more dry fuel and lets a bit more grass cover grow, which helps fire to penetrate into thicker areas.

'The rust is easy to spread. If someone nearby has got rubber vine rust, it's just a matter of picking up a little plant and taking it home. When it was first released in the dry season at the airport in Georgetown, we couldn't find it. Then three weeks later, it came up—it needs water and humidity to get going.

Within a year, it was here, about 50 km from town. As I was planting my little rubber vine plants with rust I saw it everywhere!

'I'm confident that the rust will reduce isolated plants down to a stage where they're not really a problem. Research reckons that rust accounts for three or four per cent mortality per year—over a 10-year period that'll thin it pretty well. We started off by basal barking the isolated plants with AF Rubber Vine spray and diesel at standard rates—1 in 40, I think. Then we used Grazon DS as a foliar spray to sort out the ones in isolated areas that were a bit thick.

'Both were very effective, but for different purposes. You wouldn't basal bark hectares of rubber vine that's very thick—you'd use foliar spray, and you're not going to drive a tractor and spray tanks out 20 km to kill six plants. The main drawback with these methods is that they're expensive and time consuming.

'The isolated plants are only picked up during the course of other jobs.'

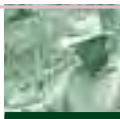
'The isolated plants are only picked up during the course of other jobs—we don't chopper muster much here at all. We use bikes and horses and go up and down most gullies during the year.

I reckon that there'd still be individual plants scattered around—probably still more out there than I've poisoned, by a long shot. We're thinking that we can knock it back to the big main areas by knocking out the outliers.

'Close to the house here I drove along the high bank of the river on the tractor with the high-pressure gun on the PTO-driven tractor-mounted spray tank. The gun has a reach of about 10 m. I came along the high bank, shooting down, then came back as close to the bank as I could and shot back up.

'We started to look at rubber vine seriously in 1998.' At that time, Greg said that the local Landcare group approached him and asked if he was interested in allowing John McKenzie, from the Department of Natural Resources and Mines, to use Green Hills for trialling control methods for rubber vine. The Ryans agreed, and John ran trials there for three years. The results indicated that burning was the best method to use.

'The long-term goal is to eradicate it, but I don't think I'll live long enough to see that. We have a pest management plan and we've broken the property into about a three-year rotation for burning. 'The way we use fire, we don't need to go and find the plants; a lot of the isolated individual ones get cleaned out by fire just with our normal burning program. 'We burn for pasture management, fuel reduction and woody weed control. We do some fire planning specifically for vine infestation, but mostly it's part of general property management. We aim to burn a piece of country every three to five years depending on the soil type and grass cover.



The sandy country, which is heavily grassed, is burnt with hot fires pretty regularly, so rubber vine doesn't grow there at all.

'We've always used our country—we don't lock it up totally just to burn it. Up here, we really have to burn before we get any rain. The moment you get rain, even if it's only 10 mm, it's the end of your fire. We don't burn green in this country—usually we have a more reliable season than we have had this year.

'We do some fire planning specifically for vine infestation, but mostly it's part of general property management.'

▲ Rubber vine on Green Hills.

'If someone's pulling a big crop of rubber vine and burning it, I suggest burning another patch close by so the cattle won't just feed in the burnt rubber vine area.
That'll also make it easier for mustering. In thick areas, the burn won't go the whole way through, and even if it does, you won't have 100 per cent kill.'

'If you can get three good fires through it, you'll kill close to 100 per cent, but to do this you'll need 1000-kg fuel load per hectare. I prefer to burn in the driest part of the day to get the best results. You need to really scorch the 30 cm above ground level, I think. Once the vine's been burnt back, the rust and normal fire management will be enough to control it.'

'You have to accept that there is a certain risk with using fire as a control method—you don't want to waste feed, and you don't want to risk a fire getting away (especially if there is a big thick clump of rubber vine). It can cause problems with your neighbours if you burn them out.

'Three of us go together to burn a big patch. We put flat grader breaks in around the area and burn into the wind to start to widen the break for when we light up with the wind. We have found that you need to put the break at least 300 to 400 m out from the rubber vine. Once we put it too close and the fire jumped from one area to the next. We intended to stage the fire, but it got a bit hectic at times, chasing around looking for a grader and running around with spray tanks. We can laugh at it now, but it was a bit worrying then.'

▲ Rubber vine on Green Hills killed using foliar spray from a tractor mounted unit with a high pressure gun.

'Burning will kill a fair percentage of the large trees[1], but rubber vine will kill them anyhow. At least with the rubber vine gone there's a chance for the young trees to get away. People used to ask what would happen to the country when we get rid of rubber vine—they thought it held the riverbank together, but I think the opposite. Rubber vine has a big canopy and nothing grows under it so the water runs through it washing everything away.

'We've lived with rubber vine for a long time—but I think we can eradicate it. I think it will have to be done gradually because it's too costly to try to eradicate it in a short time. Now that I've seen what can be done with rust and fire, I'm more confident. We're still in the middle of the battle. I haven't really noticed any improvement yet, but I'm sure there is—it's a slow process. We've probably thinned out a fair bit of the thicker stuff, but the same total area would still be under rubber vine.

'Eradicate it at the earliest possible moment—the longer you leave it, the bigger it'll be and the more expensive it'll be to eradicate. Life's certainly better without it. Introduce rust if there's no existing rust in it. I don't think the moth has been very successful—I wouldn't worry about it.

'It wouldn't cost anyone who hasn't got rubber vine very much at all to keep it out—new infestations will only be a couple of plants, not acres of it. 'I reckon it's pretty cheap insurance if you just have to go out and spray a couple of plants and use fire to keep it out. Don't let it overrun you—set little goals—one goal for us was to clear it from the river crossing to the house so we could sit out the back and see the river. It's satisfying to achieve one goal, then you go on to the next.'

[1]Ensure that you comply with all state and territory tree-clearing guidelines

Working to a plan

Brett and Jenny Epple of Alstonvale near Hughenden

Brett and Jenny Epple have been working Alstonvale for eight years. About 6 800 hectares of the 10 000-hectare property is basalt-derived 'jump up' plateau country. The property, which has fertile, cracking black soil with floating rocks, was smothered with rubber vine when Brett and Jenny bought it. They also have rubber vine on their river country.

'It was a rude shock when I first bought the place', said Brett, 'I could see that rubber vine was a major problem here but nothing had been done about it, and no control methods really applied. It was in real danger of taking over all that fertile tableland country. I just couldn't figure out how to do it year after year.'

'I bought the place in '94. Up until 18 months ago the rubber vine was too overwhelming; it just got thicker and thicker. It spread a lot between 1994 and 2000—just imagine the 'day of the triffids'! Rubber vine is very cunning; plants in the middle of a clump drop no seed, but isolated and outside plants spread their seed everywhere. We could go along an old fence line we pulled down without difficulty three or four years ago. I went along there this week and I was surprised as I couldn't see any traces of the old fence. In 1998, there was only a small patch we had to treat with not another rubber vine plant in sight from the fence line.

'It's a really beautifully adapted plant—nothing alters it; it's poisonous; its seeds open at the windiest time of year; it doesn't pod up in the centre of a big patch; it supports itself to reach over trees, then it broadcasts its seed from the top, and it creates its own mulch blanket. You might clear a cutting to get across a creek or when you're mustering, then you go down the next year and it's closed over. Cattle hide in it at mustering time.

'I used to put blinkers on when I went up to the tablelands. Now I can do something about it, I can see light at the end of the tunnel. We first trialled Graslan about 18 months ago. The beauty of it is that you can carry a little with you wherever you go. I call it the wonder drug; it breathes a bit of life into the country. Some of the big rubber vine reshoots, but it gradually uses up its energy reserves; it shoots away a bit and dies back.

Jenny Epple of Alstonvale.

'Graslan is such an easy chemical to apply, and is a lot easier to use than sprays. For our first effort, we used AF Rubber Vine and diesel mix, but we soon realised that if we were to seriously attack this problem we needed something different. When they took AF off the market, only Access was left. That'd break you by the time you mix it with diesel on the amount of infested country we have.

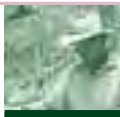
'We knew something was going to die and it was going to be the rubber vine, not us! It's nice to go up there now, and see the difference. It's amazing what grass comes up under the dead rubber vine—if you don't dose it too strong.

'We've been working up there since November last year. I've put out 170 kg of Graslan and treated more than 2000 acres (800 ha). I just put the tractor in crawler gear and use the windmill to keep my bearings because you don't leave tracks on the rocks!

In thick patches, I drop the blade and cut a track. We've been back over areas we'd already done last year; new plants and missed plants are easier to see. When you hit them with Graslan, the seedlings close to plants tend to get tickled by the Graslan too. We've been at it for about four months now, and have used about eight-and-a-half boxes. It's just as bad up on the other tableland. In all there are 13 268 acres (5307 ha) of tableland on the 25 000-acre (10 000 ha) property, and Graslan costs $539 per 20 kg. We've really only just scratched the surface.

'You buy a property to do property things and you end up becoming a weed expert. I'm just a cattleman, but you have to do weed control as part of management. The hardest thing to accept is that we know it'll always be here, you have to keep going back and back and back. The other way of looking at it is that it's something you just take on for life. I think I'll need to put aside two to three months every year just for rubber vine.

▾ Graslan takes about 12 months to kill the rubber vine.



'You've got to work to a plan. I always have done and always will do. Just keep on going day after day, don't wear yourself out physically. My method is to work it in a grid fashion. When we start a patch, we do all the outskirts and outlying ones then get into the tough patch.'

'We only use the Graslan on the tableland—not on the creek because we don't want to poison the trees. We slash what we can and go through with a brush-hook. On the creek flats, they've been burning every two years and following up the fire with herbicide for a 100 per cent kill. After the fire, they brush-hook any green plants and spray the cut stumps. I bought a slasher last year for knocking over stuff along the creek there. It'll knock over stuff six feet in diameter and makes a lovely mulch. We plan to go through, slash a bit and cut stump it. We should get through it in no time flat. I take care of the gearbox, I go into it slowly at high revs, but we couldn't do that on the tableland.'

Brett uses fire treatment to clear out grasses such as spear grass and feathertop as well as rubber vine, but this method isn't suitable on the tableland, because the grass is naturally short. 'I've tried putting a fire through some of the country—in some patches it burns okay, but it's not by any means the answer—you don't get any fuel and the big plants cast too much shade. You still end up with rubber vine and sometimes the fire cooks the soil', he said.

Alstonvale is north-west of the Canterbury Tablelands, and Brett believes that most of the rubber vine on his property was blown in from there. He is concerned because Fairlite Creek, which borders his property, runs into the Flinders River, which flows through the highly productive alluvial southern Gulf pastoral region to the Gulf. He said that fortunately there is very little rubber vine in the north or the tributaries of the Flinders. The seed has continued to invade his property. 'Every little spring or soak has rubber vine in it. I just wonder what you can do with it. I reckon the seed flies in the wind. Cockatoos eat the pods and spread the seed; they carry the pods around too.'

> 'I'm just a cattleman, but you have to do weed control as part of management.'

Brett is convinced that for control to work, neighbours have to see that it is more than an individual problem and that they need to work together strategically to overcome it.

'Here on the Canterbury Tablelands there are four neighbouring properties. We all can see the end result if we don't do anything—you don't need to be a rocket scientist—the country will be a total cot case. If this country was back to its natural state, it'd be the most productive country. Either people have to change their mind-set or someone's got to change it for them. It's good to see that there's funding made available. I just hope it isn't a one-off thing.'

'If you let rubber vine go, the value of the property would plummet. I'll spend more on it per acre than the country's even worth—it's just one of those things that you've just got to do. It's just too nice a country. I don't reckon I'll make my money back, it's just for self-satisfaction—just to see the country decent again'.

'If you let rubber vine go, the value of the property would plummet.'

Brett and Jenny have found that, though rust defoliates the rubber vine at times, on the tableland it is not very effective.

'It's too dry up there for the rust—if we waited for it, the vine would take over and you'd walk off. Ideally, what we'd like is some biological agent but they say it's unlikely anything new will become available for rubber vine.

Brett is allowing fuel to build up in the area as he intends burning next season. He plans to fence off his river country with three-strand barbed wire or electric fencing. He would prefer not to use fire where there are towers of rubber vine up the trees. Any plants growing outside the burnt area he will treat with AF. He will continue treating the tableland area with Graslan.

'As long as Graslan stays on the market, and there's funding around to help us, we're okay. There's no other way we can control the vine on a big scale in this type of country.,

Community initiatives

The 70-Mile Range Landcare Group barter days

Colin and Shirley Healing of Warrawee station, near Charters Towers

Warrawee Station is a cattle property owned and operated by Colin and Shirley Healing, and their sons John and David and their families. It is situated 60 km south-east of Charters Towers in North Queensland. Warrawee is part of the 70-Mile Range Landcare Group, which came together in 1995 because of weed control projects under the Drought Regional Initiative. It holds three or four meetings a year to discuss various matters, and it was through these meetings that the idea of 'barter days' was presented to the group.

▾ Col Healing inspecting recently completed work on Warrawee Station.

'I came here in 1959—44 years ago'. Col said. 'Rubber vine was here then, but it has increased since. Rust has been a big help in slowing the spread—it's good because it inhibits the plant's ability to produce healthy seed.'

As part of their overall weed management strategy, the Healing family started using the barter day system for weed control about three or four years ago. The broad concept is that a group of landholders—preferably from adjoining properties—makes a commitment to work on each other's properties to complete a project.

'In the 70-Mile we have a fairly large weed problem—in fact, the whole of Dalrymple Shire has a fairly large weed problem', Col said. 'The first barter day was held without funding to see if the idea was workable with the group. Since then, funding has been secured through National Heritage Trust Weeds of National Significance projects for woody weed control.

'Where did the idea of barter days came from? Well, a group has been doing it for prickly acacia in the Flinders Shire, and Bob Shepherd and Joe Rolfe from the Department of Primary Industries, Charters Towers, and John McKenzie from the Department of Natural Resources and Mines told us how well it had worked for that group. The idea was really pushed by NR&M and DPI because of those guys out west.

The departments have tried to sell the idea to other groups in the shire but, as yet, none has been able to get it together.

'We decided we'd try the barter day and see what happened', Col said. 'The idea was pretty hard for this group to take on until we did one. When they worked out that they got seven workers for a day, they realised that they could cover quite a lot of ground in that time and the labour costs were nil. Most of the group got quite interested. If you can get a couple of good days to start with and people can see the result, it gives them some incentive. Using the barter day system, you can cover a larger area more quickly and you can see a result.

'The first thing you need is a common goal—for everyone to want to rid themselves of certain weeds. If everyone agrees, you're halfway there, but if you're trying to get your paddock clear and your neighbour isn't, then you're fighting a losing battle. Barter days help with that problem.

'As landholders and their staff need to know how to kill the weed, training is necessary. If they don't know how to spray the weed properly, it's a complete waste of time and money. They have to know that it's important to pull the rubbish back from the "crown" as it is called—where the plant comes out of the ground. If the poison doesn't reach all around, it'll shoot again, so one of the main things is to get them to put enough poison on the plant.

'This is very important, and I think that if the government wants people to do this program, it needs to help groups with training through NR&M and DPI. When we first started, we were really lucky—we had John McKenzie of NR&M for a day. He demonstrated the process using water on a rubber vine plant in a pot. He then spent a day here in the field with group members poisoning rubber vine and telling them if they were doing it incorrectly.

'It's important that the group as a whole decides how to manage the timeframe for barter days. We started doing it for a week at a time, but that meant that the whole week was written off, and we found that it didn't work for some landholders on properties where there was only the husband and wife. We now have barter days on Thursday and Friday, take Saturday and Sunday off to catch up with work at home, then have barter days again the following Monday, Tuesday and Wednesday.'

◂ Rubber vine on Warrawee Station.

'Normally there are seven properties involved and we get two people from each place. Last time, though, we only had eight people. If someone brought two people here, then we'd take two people over there to their place', Col said. 'All the properties involved are adjoining—there are no black holes. Each one would be about 100 square miles, so I'd say there'd be about 500 000 hectares covered by the group in all.

'Over the five days, we go to five different properties working on a roster system. The property owner usually chooses where we are to work. Each property manager has their own project, rather than the group having a project plan for the whole area. The 70-Mile is a large area and it is not possible to do that at this stage.

'The host landholder pre-mixes the herbicide before the day starts. We use Access at 1 L in 60 L of diesel, standard rate. Some people say, "Count the glugs!" You can't do that, it won't kill the weed and you're wasting chemical and time—you have to do it by the book.

'We have a couple of Toyotas', Col continued, 'one with tucker boxes and safety gear, and the other with poison and spray pots. In the morning, we park the vehicles at the start, fill up and away we go. When someone empties their pot, they go back, refill it and move the vehicle closer. A couple of people go back to bring the vehicles down for smoko and dinner.

'Whether you like it or not, you won't get 100 per cent kill, and so far we don't have an effective technique. The weed will start to die and you think, "that's good", but then you get the first rain and you see sprouts that have been missed. It depends on seasons, I think—the drier it is, the less sap flow there is in the plant, and the chemical loses it effectiveness. You need to pick the weather. Barter days are a great concept, but you still need to go back over the area to get what has been missed. You've just got to keep on top of it otherwise it doesn't take very long for it to take over again.

'The group also shares a carton of beer in the afternoon wherever it is we have been working. I think it's not a bad social thing. Even though the group has worked together during the day, they get more chance to talk to each other—they probably don't see each other too many times during the year otherwise.'

▸ Col Healing inspects the basal bark kill.

▲ Basal barking has produced good results on Warrawee Station.

The Healing family has learned that barter days work only when the people involved get on well together.

'It's important that the person who is responsible for the land should be there when the work is done on the place. The owner should mix the chemical and supervise the work so that afterwards they can't complain. It's also important people give plenty of notice if they need to pull out—it can be frustrating when someone pulls out on short notice. As the chemical is mixed up the evening before, if someone doesn't turn up it means that everyone has to work a couple of hours longer. The group needs to agree that 24 hours notice must be given unless there's an emergency.

'Also', Col said, 'some people haven't got a plan—they've got bits and pieces done everywhere; I don't know whether they're ever going to clear it up themselves, unless they're made to. You need a broad work plan—if you do a bit here and a bit there you're not achieving anything. We've done One Mile Creek system all the way up to the top'.

A few other things have contributed to the adoption and success of barter days in the 70-Mile area.

'A couple of years ago, the state government handed responsibility back to local government for the management of weeds. Dalrymple Shire sent maps to everyone in the shire and on them you had to draw what weeds you had and where you had them. They tried to do a big map of the shire with all the weeds on it. We had to do a property plan for the control of our weeds, colour it in according to what weeds we had, and say what we'd done, and what we intended to do about them. People were prompted to do something because they could write that on their property weed plan.'

With the help of Dalrymple Landcare, Col was also instrumental in getting government funding for four weed teams that operate in the Dalrymple shire. This funding was available through the Reef to Rangelands Initiative, part of a pilot project set up to demonstrate the work group idea to other shires. The four members of each team have been trained to spray herbicide. They work throughout the year on a roster system. The landholder supplies the diesel, accommodation and food for four days, and the government funds the cost of the herbicide. This has given landholders an incentive to do something about their weed problems.

'Often landholders use the teams to mop up after a barter day. It's not that costly. The system works well but supervision is the thing with these teams—it's better if the landowner works along with them. We wanted them to be kept on and trained properly, but they've been moved from place to place. I suppose if this means that these people can go out and get a job, then it's worthwhile—but we were hoping to have permanent teams that would develop expertise.

'When people apply for funding', Col said, 'the more they write themselves and the more they are involved with the application process, the better the applications will be. When groups apply for government funding for specific land management projects, they should include funding for the barter day system. These are looked upon favourably as they are seen to be a community effort. When signing the application, people need to understand what their obligations will be if funding is granted—they need to know what they're applying for and what they intend doing with it.

'Three places definitely want to continue with barter days, whether the group gets more funding or not; the other four are a bit iffy—but they want the poison.

Our Landcare group started at about the time the Drought Regional Initiative came into being. Everyone got a bottle of herbicide—whether they used it or not is the big question—but it was a hell of a good incentive to get people started. This poison was to be used for barter days, and that's what we'll use it for. If people sign up for barter days with the group, I think that it's a benefit if they attend and use their poison with the group. This also ensures that it is being properly used and the group is happy that the job is getting done!

'It's a system that could work well for groups with the common goal of working towards getting rid of woody weeds, but it could be applied to any weed. Ultimately, success depends on people's attitudes.'

Industry and government initiatives–
Volunteers and local government projects

The Wildlife Preservation Society and Fitzroy Shire Council.

Over the past few years, members of the Capricorn Branch of the Wildlife Preservation Society of Queensland, and staff of Fitzroy Shire Council have worked with volunteers on rehabilitating the Duck Pond on the outskirts of Rockhampton. John McCabe of the Queensland Parks and Wildlife Service has provided management advice.

John said, 'The Duck Pond is a significant area for birds, frogs and other wildlife which are drawn there by the nearby lagoon and surrounding trees. It is a 16-hectare reserve on the southern side of town, with about one-third of its area covered by water due to its position in a natural depression, and to back flow. There are several power lines and a railway running through the reserve, which was formerly used as a dumping ground. It was heavily infested with prickly acacia and rubber vine, which were growing all through the rubbish'.

'It was originally a recreation reserve managed by the Fitzroy Shire Council,' he continued, 'The Wildlife Preservation Society was involved in its conversion to an environmental reserve, under the joint authority of the Queensland National Parks and Wildlife Service, the then Department of Natural Resources (DNR), and Fitzroy Shire Council'.

According to Luke Ferguson of the Fitzroy Shire Council, although weed control on the Duck Pond is probably not very strategic because of its position at the end of the catchment, the pond is obviously a significant habitat for birds, frogs and other wildlife.

'BHP sponsored a team of volunteers for the project', Luke explained. 'It cost us $2000, which covered their base travel and their personal safety equipment such as boots and hats. They needed shelter, a kitchen, showers and toilets, so we used a Scout Camp'.

'Most of the volunteers were young—17 to 20 years old—and came from the United Kingdom,' Luke said. 'They usually stayed with the program for a month or two and travelled around for different projects. It can be hard working with volunteers. Usually, in a good group of seven or eight volunteers and a team leader, two or three are good and keen, the rest are only there for a good time. It only takes a few people to be a bit interested to get the others working well. If there is only one good one, the extra numbers don't help. As they've usually had no experience in this sort of thing, very few of them are interested in land management. You need to show them everything and you virtually have to be with them full time.'

'The teams are mostly with Conservation Volunteers of Australia', John said. 'The participants we had on this project were mostly overseas students on holiday, but it's open to Australians too.

'They were paid a set amount each a day to cover their transport and food. We usually got them for about eight hours a day for four days. As they moved around a fair bit, the other day was spent travelling from their previous location.'

Luke said that a lot of time was spent doing things other than weed control. 'For example, on Monday afternoon we did safety induction, so we really only had Tuesday, Wednesday and Thursday, and then they left on Friday morning.'

John said 'The Fitzroy Shire Council provided a spray unit trailer and four people to carry out basal bark treatment; DNR lent a boat and other equipment, and community groups gave their time and materials they could source. We wasted a lot of time borrowing tools and then returning them at the end of the job—it would have been better if we'd had a trailer set up. The Fitzroy Shire Council purchased most of the herbicide.

'If the volunteers were to use Access, we were required to provide them with long-sleeved overalls, give them information sessions on safety, provide technical advice on how to spray, and have one or two officers with them all the time', Luke added.

'You need to vary the work to keep their interest up,' John said. 'They need a break from weeds and fencing. Last time we did a wildlife survey and I trained them to identify native vines which look like rubber vine'.

According to Luke, John put a different spin on things and showed the volunteers a different side of the project. 'Officers from DNR also gave talks to the volunteers', he said.

'You have to scale down your expectations and just work on small areas of weeds at a time', said John. 'The first team went through when the rubber vine was drought-affected and we had a poor kill until five weeks later. The second team hit it in April and got a really good kill. That team also did a bit of work on the Long Island project. 'We've just had the last Conservation Volunteers team through,' John explained. 'On the first day, I got them basal barking in the thickest part of the rubber vine. I thought it would take them three days, but by the end of the day they'd reached the thinnest part. The team approach can work well on a big job, but they can miss a lot. Last time I put one of the team on spotting, which helped.'

Luke said, 'We planned to have a few burns to make access a bit easier, but weather conditions were never right. In the future, we'll only need to do a follow-up spray a month after rain, which we'll probably be able to complete in half a day.

'All in all, using Conservation Volunteers worked well with a minimum of cost', John said. 'The main issues are affordable accommodation and safety. It'd be ideal to provide reasonably comfortable facilities in the bush or on the edge of town. Jeff Simmons from the Wildlife Preservation

Society gave us a real push to get us going, and using the volunteers was the way to achieve it.'

'Although the volunteers didn't do a perfect job, it was because of them that National Parks, the Department of Natural Resources, and the Fitzroy Shire Council came together to complete the task, and the community benefited from the experience. Volunteers are a good source of labour but they require a substantial input of time to get what you want out of them', Luke said.

Killer weed!

Ross McKenzie, Principal Pathologist for the Animal and Plant Health Service of the Department of Primary Industries and Fisheries said that although rubber vine is not extremely dangerous to cattle, it is potentially poisonous and can be toxic whether eaten fresh or dried. For example, stock have been reported as succumbing to rubber vine poisoning after eating fodder from the ground near rubber vine plants. Ross said that rubber vine poison could affect any herbivorous stock and though most reports relate to cattle poisoning, horses have also been affected.

To avoid having stock browsing on new rubber vine shoots after an area of vine has been burnt, best practice suggests that if cattle cannot be excluded from the site, two areas should be burnt simultaneously—one with little or no rubber vine on it that would provide them with an alternative grazing area.

Ross explained that the toxin in rubber vine is a cardiac glycoside similar to that in oleander. It specifically affects heart muscles, but can also induce diarrhoea. Stock can recover from rubber vine poisoning depending on the amount consumed—if this is large, they will die rapidly; if only a small amount has been eaten, they may scour for a few days but will recover.

Most landholders report stock dying of rubber vine poisoning during muster. Ross explained that recovery also depends on the activity of the stock after ingesting the vine—if they are mustered at this time or otherwise placed under stress it is more likely that they will be badly affected by the toxins and may die suddenly. According to Ross, rubber vine might have been responsible for some paddock deaths that have been attributed to snakebite, but he qualified this by saying that rubber vine contributes only a small amount to field mortality.

For further information

Contacts

Enquiries on declared weeds should first be referred to your relevant local government or shire council. Obtain weed information sheets from state and territory government agencies and from their web sites.

Table 3: State, territory and general contacts

Organisation/department	Contact details
Queensland	
Department of Natural Resources, Mines and Energy	Tel: 1800 803 788 Web site: www.nrme.qld.gov.au
Northern Territory	
Department of Business, Industry and Resources Development	Web site: www.dbird.nt.gov.au
Western Australia	
Department of Agriculture	Email: enquiries@agric.wa.gov.au Web site: www.agric.wa.gov.au
New South Wales	
Department of Agriculture Web site	www.agric.nsw.gov.au
Department of Infrastructure, Planning and Natural Resources	Web site: www.dipnr.nsw.gov.au
General	
CSIRO	Tel: 1300 363 400
Weeds Australia	Web site: www.weeds.org.au
Weeds CRC	Tel: 08 8303 6590 Email: crcweeds@adelaide.edu.au Web site: www.weeds.crc.org.au

Further Information

Further information can be obtained from the following publications:

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Declaration details in Australia

The following information on the declaration details of *Cryptostegia* spp. in Australian states and territories has been extracted from the respective state government web sites. For further information, please refer to the relevant web site. See p. 70.

ACT
Not declared.

New South Wales
Not declared.

Northern Territory
Cryptostegia grandiflora declared Class C:
Not to be introduced to the Territory.

Queensland
C. grandiflora declared Class 2:
Ban on sale, introduction and use;
control is required.
C. madagascariensis declared Class 3:
Ban on sale and introduction.

South Australia
C. grandiflora proclaimed as Class 11 Weed of National Significance:
Sale is prohibited; control not required.

Tasmania
Not declared.

Victoria
Not declared.

Western Australia
C. grandiflora and *C. madagascaraiensis* declared P1 for whole of the state:
Prohibits trade, sale or movement.
and declared P2 for whole of the state:
Eradication of existing and new infestations.