

# Parthenium weed

## Why is parthenium weed a concern?

Parthenium weed is a concern in Queensland because it affects the viability of primary production – both livestock and grain enterprises – as well as causing health problems for humans and animals. The [main infestation](#) is through Central Queensland

Parthenium weed is likely to become more competitive as carbon dioxide in the atmosphere increases (known as the greenhouse effect).

Parthenium weed ([Parthenium hysterophorus](#)) was introduced to Central Queensland in the 1950s in a shipment of grass seed from the United States of America. There are two different biotypes of parthenium

weed present in Australia from two separate introductions - Clermont and Toogoolawah. The Toogoolawah population appears to be different and is much less aggressive than its northern counterpart.



*Parthenium weed affects the viability of agricultural production in Central Queensland*

### **Parthenium weed affects agricultural viability**

In Central Queensland parthenium weed is a serious problem. In cattle country it dominates pastures under continued heavy grazing and it has the potential to exclude useful forage plants decreasing pasture productivity, carrying capacity and land values.

Parthenium weed has also spread to nearby grain-producing areas of Queensland where it may threaten exports by contaminating grain and other produce. Although parthenium weed is not yet a major crop weed, as it rarely affects crop yields, it is a burden to the landholder because paddocks often need reworking or spraying before planting.

Parthenium weed can inhibit pasture growth and seed germination of other plant species. Other effects of infestations include that it:

- competes directly with preferred pasture species
- reduces pasture vigour and seed set
- leads to habitat/ecosystem changes
- taints sheep meat and dairy milk
- causes [human health](#) problems and [animal health](#) problems.



*Parthenium weed, Parthenium hysterophorus*

## Preparation to control parthenium weed

There are a few ways that landholders can better prepare themselves to control parthenium weed. One of the first steps is to understand the biology of the plant. This entails being able to [identify the plant](#) and understand how it [reproduces successfully](#) and is [easily spread](#).

This basic understanding of the plant assists landholders being able to identify [control measures](#) that they can take including prevention of spread/establishment, pasture management, biological control and herbicide use.

Understanding the status of parthenium weed and the [declarations and legislation](#) which covers this plant is also an important factor in assisting its control.

## **A group working against parthenium weed**

One group working against the spread of parthenium weed is the Parthenium Action Group Inc. (PAG) is a community group formed in the Central Highlands in 1994. This group is base funded by the National Heritage Trust to promote Best Practice in the Fitzroy Basin Grazing Lands. It currently employs two project officers whose main duties are to sell the message of Best Management Practices for Parthenium weed.

The Parthenium Action Group has compiled this information on parthenium weed in order to give landholders some useful hints for parthenium weed management. [Contributors](#) of this information include many researchers and landholders.

This information includes several recent advances in the management of parthenium weed. It updates the Parthenium Weed Best Management Practices booklet (compiled in 1994 by Bloss Hickson and the Parthenium Action Group) and is available in hard copy format. [Further information](#) and a selected [bibliography](#) is also available.

## **Parthenium weed causes health problems**

### **Human health problems**

Repeated contact with parthenium weed or airborne pieces of dried plant material and pollen can cause allergic reactions. A survey in Queensland showed 10 percent of property workers in infested areas had developed visible allergies to parthenium weed (Chippendale and Panetta 1994).

Reactions to parthenium weed include:

- severe contact dermatitis
- dermatitis that develops when in contact with parthenium weed and sunlight (phytophotodermatis) and usually takes the form of an itchy, red, irritated weepy skin especially on the face and hands
- respiratory problems such as hayfever (allergic rhinitis) or asthma (allergic bronchitis)
- increased allergic reaction to other plant species (cross sensitivity).

Typical symptoms of an allergic reaction to parthenium weed include:

- skin rashes (itchy, red, irritated and weepy skin.)
- peeling skin
- puffy eyes
- swelling
- fatigue
- weight loss

Reactions to parthenium weed can occur on first contact or may take longer to develop after a number of exposures. The severity of a reaction may worsen over time.

The best way to prevent an allergic reaction is to AVOID contact.

### **Animal health problems**

Parthenium weed is also toxic to animals. It can cause:

- dermatitis with pronounced skin lesions on all animals or horses and cattle
- eye irritation in working dogs
- loss of condition
- death from rupturing of and haemorrhaging of internal tissues and organs.

## **What is parthenium weed (*Parthenium hysterophorus*)?**

Parthenium weed is a branching, annual herb with pale green lobed leaves, a deep taproot and erect stem that can grow to more than two metres high. It has small, creamy white flowers containing five black seeds. The plant has soft fine hairs (about two millimetres long) on the stem and leaves.

### ***Parthenium reproduces successfully***

In Queensland, parthenium weed germinates mainly in spring and early summer. Spring seedlings have a longer life span and therefore grow to a larger size. Parthenium weed produces flowers and seeds throughout its life and dies in late autumn. Under suitable conditions it can grow at any time of the year.

Part of the reason for parthenium's success as a weed lies with its reproductive ability. Parthenium weed can germinate, grow, mature and set seed in 28 days. It is a prolific seed producer capable of up to 100 000 seeds per plant.

During a good season four or more successive generations may emerge. In healthy vigorous pastures, plants that germinate later in the season may find it more difficult to compete with pasture species.

Up to 340 million parthenium seeds per hectare can be present in the surface soil compared to 120 000 native grass seeds. During germination, parthenium weed is capable of out-competing other plant species, especially on heavy cracking clays.

Parthenium seed is viable for an average of two years and up to twenty years (although seed near the soil surface is rarely viable beyond two years). Undisturbed, buried seed will stay dormant for a longer period.

To germinate, parthenium weed needs sufficient rain to leach germination inhibitors from the seed. In climates where rainfall is irregular, this dormancy mechanism prevents untimely germination. The optimum germination temperature is 22-25 °C.

### ***Parthenium weed is easily spread***

Parthenium weed is a highly competitive plant and is extremely effective at colonising.

- weak or overgrazed pastures with low ground cover
- disturbed and bare areas such as roadsides, tracks and eroded sites
- cultivated areas
- heavily stocked areas such as stock yards and watering points.

Parthenium weed will colonise a range of vegetation and soil types including downs, floodplains, softwood, brigalow and gidgee scrub soils.

Parthenium weed seed is spread easily by:

- water
- farm machinery
- industrial machinery
- feral animals
- humans
- vehicles
- stock fodder
- movement of stock, grain and seed.

## **Main infestations occur in Central Queensland**

The main infestation of parthenium weed is from Charters Towers to Injune. Parthenium is well established in the Central Highlands. It is found in isolated infestations as far west as Longreach and south to the Queensland/New South Wales border. Parthenium weed has the potential to spread to many other areas of Australia. Infestations have been found and controlled in northern and central parts of New South Wales, in the Northern Territory and as far south as Ballarat, Victoria.

Parthenium weed grows best on alkaline, clay-loam to heavy black clay soils, but tolerates a wide variety of soil types.

Parthenium is currently presenting the greatest problem on the cracking clays of the Central Highlands of Queensland. If pasture is overgrazed during dry periods experienced in this area, it can be difficult to re-establish pasture in the presence of around 1 500-4 000 parthenium seeds per square metre. For parthenium weed to establish on other soils a more severe soil disturbance is required.

## **Declarations and legislation affecting parthenium weed**

### **Parthenium is now recognised as a weed of national significance**

Parthenium weed is a declared plant under the provisions of *the Rural Lands Protection Act 1985*. It is declared under three categories in different areas:

- Category P2 - where the plant must be destroyed
- Category P3 - where the infestation is to be reduced
- Category P4 - where the plant should be prevented from spreading.

Parthenium weed is a Category P2 plant in most, but not all, local government areas in Queensland. Parthenium weed is declared Category P3 and P4 in Bauhinia, Belyando, Bowen, Broadsound, Dalrymple, Daringa, Emerald, Fitzroy, Nebo and Peak Downs Shires.

Under new Queensland legislation, parthenium is expected to be declared as a critical weed and as such parthenium weed is declared noxious in all states of Australia. In Queensland under the *Agricultural Standards Act 1994* the sale of commercial pasture and crop seed containing parthenium seed is prohibited. The *New South Wales Noxious Weeds Act 1993* contains specific provisions to prevent agricultural machinery entering from Queensland without an inspection for 'notifiable' weeds such as parthenium weed.

## Control measures for parthenium weed

The key to parthenium weed control is to integrate the following four areas:

- prevention of spread/establishment
- pasture management
- biological control agents
- herbicide use.

### 1. Prevention

The easiest way to deal with parthenium weed is to prevent it from establishing in the first place. Simple precautions, such as monitoring pastures, can enable new parthenium weed infestations to be quickly treated.

#### BE AWARE of parthenium weed:

- can you recognise parthenium weed - awareness is essential for parthenium weed prevention?

#### BE AWARE when purchasing stock feed:

- always feed stock in the same area for easy spotting of plants
- regularly and frequently monitor feedlots, chicken pens, stables, horse paddocks and other grain/fodder feeding areas.

#### BE AWARE when buying crop or pasture seed:

- do not purchase seed that does not comply with the relevant seed Acts.
- do not purchase seed infected with parthenium weed.

#### BE AWARE when selling grain, seed or hay:

- ensure that your product complies with the relevant agricultural standards.

#### BE AWARE of the origin of stock.

If the origin of the stock is uncertain, take the following precautions:

- dip and yard stock for 48 hours
- when new stock arrive place them into an easy to monitor holding paddock
- bang-tail cattle, as the tail is a potential source of seed (short haired cattle are less likely to carry seed)
- avoid moving stock during wet periods as muddy cattle readily transport seed
- it is unlikely that the seed will remain viable after passing through a beast.
- horses are thought to excrete viable seed

#### BE AWARE of the origin of machinery and vehicles.

These are a common means of weed seed spread so to minimise these as a source:

- double-check machinery (including the interior of the vehicle) moving onto your property
- always move vehicles and other machinery over roadways and tracks that are easily monitored
- tarp down truckloads
- drive visitors around in your own vehicle
- ensure service providers' vehicles, (telephone, electricity, gas, railway, etc.) are free of parthenium seed.

#### BE AWARE of pasture composition.

Healthy pasture cover reduces the occurrence of parthenium weed. Problem areas occur where grass crown cover is reduced and include:

- heavily grazed areas
- watering points
- roadsides
- holding paddocks.

**BE AWARE** of isolated outbreaks:

- do not pull out seeding plants as this will encourage further germination – mark the area and spray.
- direct contact can produce allergic reactions
- spot spray isolated outbreaks with a registered residual herbicide
- mark sprayed plants with a steel post
- check the site every 21 days or within ten days of rain.

**BE AWARE** that drought heightens the movement of livestock and fodder:

- this increases the spread of parthenium seed.

**BE AWARE** of your local vehicle/machinery washdown facilities.

These are located at:

- Rolleston
- Springsure
- Emerald
- Alpha
- Gracemere
- Biloela
- Injune
- Taroom

**BE AWARE** of procedures for cleaning vehicles.

All the equipment you need is a vacuum cleaner or dustpan and brush, hose and household water pressure. When cleaning heavy machinery remember to check:

- the radiator
- cabin floor
- track frames
- air cleaner
- adjusters
- belly plates.

There are numerous places where weed seeds can lodge on a vehicle including:

- chassis rails
- spare tyre and fuel tank
- mudguards
- spring shackles and U-bolts
- engine and transmission protector plates
- cabin floor
- radiator
- under seats
- engine bay
- tool boxes.

## **2. Pasture management**

**Pastures in good condition suppress parthenium**

Parthenium infestations generally are a symptom of pasture condition problems which are usually influenced by grazing management. Good grazing management will maintain or improve pasture condition thereby increasing resistance to parthenium infestation leading to improved productivity.

## Understanding pasture management

### Weeds indicate poor pasture condition

Sustainable land use can only be achieved by addressing the cause of poor pasture condition, not the symptom. This can be done through:

- improving pasture condition rather than focussing on parthenium eradication
- adopting grazing strategies that maintain healthy, robust, competitive pastures.

### Integrated parthenium management systems give the best results

Healthy, robust, competitive pastures (complemented with biological control agents and strategic herbicide sprays) offer the most effective parthenium weed management options.

Pasture management involves:

- maintaining competition
- monitoring pasture condition
- understanding grazing pressure
- setting stocking rates
- spelling paddocks
- managing water points
- fencing different land types
- strategic burning.
- strategic herbicide use

## Achieving and maintaining pasture competition

### Parthenium colonises land that has been made vulnerable by disturbance, overgrazing or flood

To stop parthenium you need to:

- maintain healthy, robust, diverse, competitive pastures
- encourage and assist degraded pastures to repair and become competitive.

Aggressive exotic grasses such as buffel, green panic, rhodes, purple pigeon, bambatsi, and urochloa provide good competition when reseeding or establishing new pastures. Buffel is the best grass on scrub and lighter clay soils. Native pastures such as bluegrass are the best-adapted on Downs soils but are less tolerant of high grazing pressure.

You can achieve and maintain adequate pasture competition by:

- spelling in the growing-season
- rotational grazing
- herbicide spraying to encourage seed production
- reseeding grass
- herbicide spraying to encourage grass establishment
- keeping stocking rate and grazing pressure adjusted within the limits of the pasture.

Eliminating annual weeds (including parthenium) using herbicides:

- provides extra water and nutrients for grass
- allows grasses to maximise seed production
- gives grass seedlings a better chance of survival.

## Monitoring pasture condition

### Memories are short and selective

The grasses that make up a pasture, their health and yield as well as ground cover, are all measures of pasture condition. The desirable, productive grasses must dominate and produce seed to maintain good condition.

Pasture monitoring:

- assesses the current health of pastures
- picks up trends in pasture condition
- indicates the direction pasture condition is heading
- allows fine tuning of grazing management;
  - before the competitive edge is lost
  - before animal production declines.

### Animal performance slips long after pasture condition starts declining

'Grasscheck', developed by Department of Primary Industries, can record and measure the effect of grazing on the pasture.

## Understanding grazing pressure

### Grazing pressure is how heavily a pasture is grazed

Grazing pressure is measured by how much of the pasture animals have eaten compared with how much pasture was produced that season. In set-stocked paddocks grazing pressure varies with season.

When grazing pressure is high and prolonged:

- the desirable, productive grass component declines
- grass root systems are reduced
- pasture competition decreases
- parthenium has room to colonise and begin seed production.
- grass can not set seed
- the grass soil seed-bank can become very low
- the parthenium soil seed-bank increases rapidly to very high numbers (eg 20 000 seeds/m<sup>2</sup>).

### Grass with declining root systems cannot make maximum use of rainfall

A sensible grazing pressure considers the 'body of feed' available, rather than an 'acres per animal' stocking rate and will ensure

- animals to work in the 'top half of your grass' to avoid overgrazing
- desirable grasses are setting seed each season
- pasture utilisation matches seasonal grass production.

## Setting stocking rate

### Manage for the drier seasons the wet ones will manage themselves

Long term stocking rate needs to match what pasture is produced in 70 to 80 percent of years.

Why? If the wettest 25 percent of years are discounted from the long term average - the rainfall effectively halves! (and so does the amount of grass produced).

If stocking rate is set for the average rainfall then overgrazing will happen in 50 percent of years (the dry ones) and pastures will not have time to recover in better years.

## Spelling paddocks

Match the planned rest periods to suit the needs of the pasture plants (not just the animals)

Spelling paddocks at risk from parthenium allows:

- grass to redevelop root systems
- grass crowns to build up plant reserves
- grass to seed, rebuilding depleted soil seed banks

Spelling parthenium infested paddocks encourages pastures to:

- improve in condition
- re-establish competition.

The first six to eight weeks of the growing season are the most effective spelling opportunity as:

- grass is drawing on stored reserves for new growth
- new growth needs time to rebuild plant reserves
- grass roots are reactivating
- grass seedlings are establishing.

Native and most exotic grasses are dormant in winter and can be moderately grazed during the no-growth period.

Native grass establishes poorly when parthenium is present. Herbicide removal of a generation of parthenium will encourage pasture re-establishment during a rest period.

## Managing water points

Stock waters are points of constant very high grazing pressure (pressure points) that commonly:

- have low ground and crown cover
- lack pasture competition
- are highly parthenium susceptible
- become parthenium seed dispersal areas.

To overcome high grazing pressure points:

- establish several stock waters per paddock
- rotate stock around water points.

## Fencing different land types

Better grazing management could be achieved if properties were fenced to land type

Pasture composition is determined by land type. Palatability differences within paddocks leads to uneven grazing pressures, creating potential parthenium susceptible patches.

Flooded country is very prone to parthenium weed as grass is often killed by floodwaters, which may also be carrying parthenium seed. Flooded pastures need adequate rest from grazing to regain their competitive edge. Cattle may also need to be excluded if prevention of parthenium seed spread is important.

## Burning

Burning is not generally accepted as a management practice for parthenium weed as it:

- increases the vulnerability of land
- requires sufficient fuel (parthenium weed does not burn well)
- may damage native pastures.

Success has been achieved, however, on harder country if used in a good season and in conjunction with other management practices.

However research has shown that smoke enhances germination of native pastures and may inhibit germination of parthenium weed.

### 3. Biological control

*Zygogramma* beetle The Department of Natural Resources has been researching biological control in Australia for 21 years. During this period, nine different insect species and one rust disease have been released.

#### Current distribution of biological control species

- *Zygogramma*, a leaf-defoliating beetle (pictured right), is now widespread from Emerald to Moolayember and is found in isolated patches further north.
- *Listronotus*, a stem-boring weevil, is established throughout the Comet river system, from Clermont to Springsure and in the Suttor/Bowen river systems. It occurs in isolated patches in the Belyando Shire and the Isaac/Connor river systems.
- *Smicronyx* is a seed feeding weevil that is now established in the Comet river system and north to Clermont.
- *Puccinia abrupta* var. *parthenicola*, the winter rust, has established sporadically in the southern region, around Rockhampton and from Rolleston to Injune. It's establishment further north may be inhibited by and higher temperatures.
- *Epiblema*, a stem galling moth, and *Bucculatrix*, a leaf-mining moth, have established in all areas.
- *Conotrachelus* has established in the Rolleston district, but its range is not yet known. Releases are continuing.
- *Platphalonidia mystica*, a stem boring moth, and *Stobaera Coccina*, a sap sucking beetle, have not become established.
- The root-boring moth *Carmenta*, is currently being mass reared and released in Queensland.
- Releases of a second rust, the summer rust *Puccinia melampodii*, will start in the summer of 1999/2000.



Control by leaf-defoliating  
*Zygogramma* beetles

#### Nursery sites for biological control

Field collection and distributing biological control agents will help reduce your local parthenium weed infestation. Community involvement in the field collection of bio-control agents can greatly speed up overall establishment and distribution.

For best results a nursery site should be developed. This can be done in collaboration with your local Landcare group and/or neighbours.



An ideal nursery site would have:

- constant moisture
- lush growing parthenium weed
- a continual replenishment of biological control agents – it should be self sustaining if it is any good.

The only constraint to a good nursery site is the abundance of lush parthenium weed. Good nursery sites can be as simple as a leaking pipe or tank. An irrigation system is effective, but this type of system requires constant monitoring. Other ideal sites are infested black soil creek flats, gullies or swampy areas. Isolated infestations should not be left for a nursery, as it leaves a source for further infestation.

## Tips for establishing biological control

- To locate collection sites within your area, contact your local government Stock Route Supervisor, the Department of Natural Resources Land Protection Officer, or the Parthenium Action Group project officer.
- When collecting the biological control agents, allow a period of approximately six weeks after rain for larvae to develop. Collect as large a quantity of agents as possible and distribute all of them to one suitable nursery site to achieve maximum establishment results.
- Biological controls are not a spray: so consider their location carefully.
- Ensure that when biological controls are released, they are at the appropriate stage in the lifecycle of the weed to maximise their effectiveness.
- The biological control agents may fail to establish in some areas, even after well-planned collection and distribution. So try, try and try again!
- *Epiblema* and *Bucculatrix* do not require collection as they have established in all climatically suitable areas, however *Zygogramma*, *Listronotus*, *Smicronyx* and the winter rust are restricted in distribution and require collection and establishment at suitable nursery sites.
- *Zygogramma* can be found on the parthenium weed leaves and stems. Collect by cutting parthenium weed plants and placing them in loosely woven chaff bags for transport to the nursery site. Remember not to leave the bags in the sun. Large numbers should be put out at one site. *Zygogramma* can take a number of years to establish depending on suitable rainfall.
- *Listronotus* larvae can be found anywhere in the stem especially down near the soil level. It is necessary to pull up the stems to determine whether *Listronotus* is present. They are 'C' shaped and white. Collect whole infested plants and leave at a suitable nursery site.
- *Smicronyx* larvae are located in the flowering seed head. To determine whether *Smicronyx* is present, rub the parthenium flower in your hand looking for larvae. Collect flower heads or whole plants to leave at a suitable nursery site.
- The winter rust, *Puccinia abrupta*, can be established by growing cultures under artificially moist conditions and distributing the plants at suitable sites. The nursery should be established in autumn.

## Landholders' experiences of biological control

Since the establishment of biological controls in Central Queensland, landholders have made the following observations:

- *Zygogramma* appears to be becoming acclimatised and is now present in the drier areas of central Queensland. It is establishing more quickly and increasing in numbers and its impact upon parthenium weed. The beetles and their larvae totally defoliate mature stands of parthenium weed, preventing seed production. Working in swarms *Zygogramma* totally defoliates an area before moving on. Outbreaks may be present in different areas from one season to the next.
- The winter rust needs continual moisture. It is difficult to establish in areas with insufficient rainfall but will spread under the right conditions. The continuous infection of plants in the rosette stage can reduce seed production and longevity.
- *Epiblema*, although well established, is now beginning to acclimatise and is attacking the parthenium weed at an earlier stage. It previously attacked when parthenium weed had set seed. It is regarded as a good 'mopping up' tool. It has had significant impact on parthenium weed in Australia. The larvae gall stems and growing points and can considerably stunt growth and decrease seed production.
- *Listronotus* is not effective enough to be a solution on its own. It is becoming established in hot and/or dry areas however is slow to spread. The larvae can be highly effective; if several are present, they may kill young plants. *Listronotus* larvae can invade at any stage of the parthenium weed lifecycle and by killing the central shoot, it prevents the plant flowering and decreases the seed produced.
- Successful biological control will result only from a combination of the various biological control agents. If successful, biological control will reduce the competitive ability of parthenium weed helping to restore the natural balance.

## Continuing research into biological control

The Department of Natural Resources is continuing research into new biological control agents. The new summer rust, *Puccinia melampodii*, will be released in summer 1999-2000 and its impact will be carefully monitored.

## 4. Herbicide use

The spraying of selective herbicides is another method used to control parthenium weed. By immediately treating small or isolated infestations of parthenium weed, you can stop the spread.

### Application of herbicides

All herbicides must be registered and applied strictly in accordance with the directions on the label - data sheets should be consulted. Several applications per season may be necessary to prevent further seed production. Monitor the sprayed areas for at least two years. Using GRASS check' is a good means to record the effects of the spraying.

A common strategy is to spray with a registered pre-mix of knockdown and residual herbicide, controlling current parthenium weed plants and reducing future germination.

Correct application is the key to effective herbicide use. Timing and weather is critical when spraying parthenium weed.

The optimum conditions for spraying are when:

- parthenium weed is young, prior to seeding
- pastures are actively growing and seeding
- a good profile of soil moisture is present

- air temperature is less than 30 degrees Celcius.

The success of spraying depends on the:

- environmental conditions on the particular day (wind, temperature and humidity)
- maturity of the plant (the younger the plant the greater the kill)
- stress of the plant (parthenium weed will not uptake the chemical well when under moisture stress)
- type and condition/efficiency of spraying equipment.

For maximum control:

- the parthenium weed plant must be physically wet with the herbicide
- wetting agents must be used with all foliar herbicides
- a follow up program must be maintained.

Table: Recommended spray rates and withholding periods

REGISTERED HERBICIDES	SPOT SPRAY 1000 l/ha	BOOM SPRAY 50 to 100 l/ha	WITHOLDING PERIOD
Metsulfuron Methyl 600g/ha	5-7.5 / 100 l	10g / ha	Nil
24-D amine	500ml / 100 l	1.5 l / ha	7 days
Metsulfuron Methyl 24-D amine	5 to 7.5g + 500ml / 100 l	10g + 1 l/ha	7 days
Atrazine / 24-D Amine		3.5 l + 1.5 l / ha	7 days

Notes – Australia wide agreement to limit the use of Atrazine to no more than 3 kg active ingredient per ha per year

- helicopter usually apply 30 l – 50 l / ha
- aeroplane usually apply 20 l – 30 l / ha

## **Bibliography**

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Tropical Weeds Research Centre, Application Techniques and Pesticide Safety.

## Contributors

This information was compiled by Nichola Spooner and edited by John Chamberlain, Scott W Dearden and Anne Leitch.

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Photos by Scott W Dearden, John Chamberlain and K. Dhileepan

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### Parthenium Study Group:

The Parthenium Study Group is a research group involved in the study of the biology, ecology and control of parthenium weed. The group brings together researchers and extension officers from the University of Queensland, Department of Primary Industries, Department of Natural Resources, CSIRO and Centre for Tropical Pest Management as well as representative from Parthenium Action Group and Landcare. Meetings are held four times a year and the minutes of these meetings are published in the Parthenium Action Group's 'Weed Screeed'.

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### Information is available on the internet at:

<http://www.cpitt.uq.edu.au/parthenium.html>  
<http://chris.tag.csiro.au/Parthenium/>

### Quick Spray Units:

400L tanks, jet nozzles, 100m remote control rewind hose at \$20 per day

Cliff Smith	07 4982 1402	(Emerald/Bogantungan)
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