

Managing parthenium weed



Section 2

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Management practices

Management practices can be categorised as follows:

1. Minimising spread
2. Preventing establishment of self-regenerating populations
3. Managing pastures
4. Treating with herbicides
5. Introducing biological control agents.

The key to parthenium weed management is to integrate these practices.

1. Minimising spread

Given current resources, the spread of parthenium seed cannot be prevented absolutely, but every endeavour must be made to minimise it.

Spread at the margins of the core area of infestation is largely due to natural forces. However, humans facilitate long-distance spread or jump dispersal. Parthenium seed is dispersed on machinery, vehicles and livestock; in crop or pasture seed, grain, hay or fodder; and from roadside parthenium weed populations on previously clean vehicles.

To minimise the threat posed by these vectors and sources:

- Check machinery, vehicles and livestock moving onto clean property.
- When moving foreign vehicles and other machinery, only use roadways and tracks that are easily monitored.
- Be certain of the origin of livestock, grain, seed or hay.



▲ Parthenium seed is easily spread by vehicles.



▲ Truck washdown. Vehicles and machinery should be cleaned before leaving country infested with parthenium weed.



▶ Vehicle washdown.

- Drive visitors around in property vehicles.
- Ensure that service provider vehicles (telephone, electricity, gas, railway, etc.) are free of parthenium weed seed.
- Use vehicle and machinery wash-down facilities before leaving country infested with parthenium weed.
- Ensure a Weed Hygiene Declaration is provided when buying crop or pasture seed and livestock.
- Provide a Weed Hygiene Declaration when selling grain, seed or hay and livestock.
- Manage roadside populations.



▲ Parthenium seed can be spread through the movement of hay (above) and livestock (below).

2. Preventing establishment of self-regenerating populations

Once parthenium weed has colonised an area and established a soil seed bank, and new generations are growing, it has become self-regenerating. Every endeavour needs to be made to prevent parthenium weed from establishing self-regenerating populations by:

- creating awareness of parthenium weed
- monitoring stock feeding areas
- managing isolated outbreaks.



▲ Trucking cattle.

Awareness of parthenium weed

Awareness is essential for parthenium weed prevention. Can you recognise parthenium weed, particularly as a seedling?

It is important to monitor areas where foreign vehicles and machinery have travelled. Note that drought movements of livestock and fodder increase the likely spread of parthenium seed.



- ▶ Parthenium weed germinated in manure along with sorghum seedlings.



Stock feeding areas

For easy detection of plants, always feed stock in the same area. Monitor feedlots, chicken pens, stables, horse paddocks and other grain/fodder feeding areas on a frequent and regular basis.

- ▼ A roadside sign alerts travellers to the presence of parthenium weed.



Managing isolated outbreaks

Treat new parthenium weed outbreaks promptly. Do not pull out seeding plants as the disturbance will encourage further germination. Instead, mark the area and spray. Spot-spray isolated outbreaks with a registered residual herbicide and mark sprayed plants with a steel post. Check the site every 21 days or within ten days following rain.



- ▲ A fence line demonstrates the effect of management.



3. Managing pastures

Pastures in good condition suppress parthenium weed. In general, infestations of parthenium weed are a symptom of pasture in poor condition, a problem usually associated with grazing management. Good grazing management will maintain or improve pasture condition, thus increasing resistance to parthenium weed establishment and improving livestock production.

It is important to understand that sustainable land use can only be achieved by eliminating the cause of poor pasture condition, rather than focusing on parthenium weed eradication.

Managing towards achieving healthy, robust, competitive pastures (complemented with biological control agents and strategic herbicide sprays) offers the most effective and productive parthenium weed management option.

Pasture management involves:

- achieving and maintaining pasture competition
- monitoring pasture condition
- understanding grazing pressure
- setting stocking rates
- spelling paddocks
- managing water points
- fencing different land types
- using herbicides strategically.



▲ 1998



▲ 2000



▲ 2002

- ▲ This sequence of photos demonstrates how grazing management restores pasture health, thereby increasing resistance to parthenium weed establishment.



Achieving and maintaining pasture competition

To suppress parthenium weed, maintain healthy, robust, diverse and competitive pastures. Parthenium weed will colonise land that has been put at risk by overgrazing, flood or disturbance. Adopt grazing strategies that assist degraded pastures to repair and become competitive.

Adequate pasture competition can be achieved and maintained by spelling in the growing season with rotational grazing. It is vital that stocking rate and grazing pressure are adjusted within the limits of the pasture.



▲ Parthenium weed establishes where there is little pasture competition.

Monitoring pasture condition

Our memories are typically short and selective so monitoring and recording enable comparisons to be made across seasons. Pasture condition is a statement about the grasses that make up a pasture. It is an assessment of their health and yield as well as ground cover. The desirable, perennial, productive grasses must dominate and produce seed to maintain good condition.

Monitoring assesses the current health of pastures, picks up trends in pasture condition and indicates whether pasture condition is improving or declining. It allows finetuning of grazing management before the competitive edge is lost and before animal production declines. Animal performance slips long after pasture condition starts declining.

Understanding grazing pressure

Grazing pressure indicates how heavily a pasture is grazed. It 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 obviously must vary with season.

▼ Healthy pasture.



When grazing pressure is high and prolonged, the desirable, perennial, productive grass component declines. Grass root systems contract, and grass with diminishing roots cannot make maximum use of rainfall. Pasture competition decreases and parthenium weed has room to colonise and begin seed production, rapidly increasing its soil seed bank to very high numbers. Grass is not setting seed and the grass soil seed bank can become very low.

A sensible grazing pressure takes into account the 'body of feed' available, rather than the traditional 'acres per animal' stocking rate. It should ensure that animals do not overgraze, that desirable grasses are setting seed each season, and that pasture use matches seasonal grass production.

Setting stocking rate

Manage for the dry seasons—the wet ones will manage themselves.

Because big wet years inflate the rainfall average, the long-term stocking rate needs to match the pasture that is produced in 70–80 per cent of years. If the wettest 25 per cent 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, overgrazing will happen in 50 per cent of years (the dry ones) and pastures may not have time to recover in better years.



▲ Early growing season rest is vital.

Spelling paddocks

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

Spelling encourages pastures to improve in condition and re-establish competition. Grasses will redevelop root systems and set seed, replenishing depleted soil seed banks. Grass tussocks can also build up plant reserves, which are essential for vigorous growth.

The first six to eight weeks of the growing season provide the most effective spelling opportunity. Grass is then drawing on stored reserves for new growth and new growth needs time to replenish those plant reserves. Grass roots are also reactivating and seedlings are establishing.

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

◀ High grazing pressure during drought.





Managing water points

Stock waters are points of constant, very high grazing pressure that commonly have low ground cover and low numbers of grass tussocks, and lack pasture competition. Water points are highly susceptible to parthenium weed and often become seed dispersal areas.

To overcome high grazing pressure points, establish several stock waters per paddock. Rotate stock by alternating water points in use.

Fencing different land types

Achieve better grazing management by fencing properties to land type. Pasture composition is determined by land type. Palatability differences within paddocks lead 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 to prevent parthenium seed spread.

Using herbicides strategically

Spraying pasture with herbicide can be useful. Eliminating annual weeds (including parthenium weed) provides extra water and nutrients for grass, encouraging seed production and grass establishment. It allows grasses to maximise seed production and gives grass seedlings a greater chance of survival.

- ▶ Spraying weeds in pasture reduces competition, giving grasses greater access to moisture.

4. Treating with herbicides

Selective herbicide use is another option for the control of parthenium weed. Stop the development of self-regenerating populations by treating small or isolated infestations of parthenium weed immediately.

Application of herbicides

All herbicides must be registered and applied strictly in accordance with the directions on the label—material safety 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 and record the effects of the spraying on pasture.

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



Correct application is the key to effective herbicide use. Timing and weather are also critical when spraying parthenium weed. Parthenium weed needs to be young (prior to seeding), with pastures actively growing and seeding. A good profile of soil moisture should be present and air temperature less than 30°C.

Spraying success depends on the environmental conditions on the day (wind, temperature and humidity) and the type, condition and efficiency of spraying equipment. Plant maturity and stress will also influence the outcome—younger parthenium weed plants are easier to kill but they will not take up the herbicide as well when under moisture stress.

For maximum herbicide effect and parthenium weed control, completely wet the plant with the herbicide mix, use wetting agents, and maintain a follow-up program.

- ▼ Boom spraying is a practical way of applying herbicide to large infestations.



5. Introducing biological control agents

The Department of Natural Resources, Mines and Energy began research into the biological control of parthenium weed in 1977. Nine different insect species and two rust fungi have been released.

Current status of biocontrol agents

Zygogramma bicolorata, a leaf-defoliating beetle, is now widespread from Moolayember Dip near Injune to Emerald. It is also found in isolated patches further north.

Listronotus setosipennis, 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 lutulentus, a seed-feeding weevil, is now established in the Comet River system and north to Clermont.

Epiblema strenuana, a stem-galling moth, is established in all areas.

Bucculatrix parthenica, a leaf-mining moth, is established in all areas.

Conotrachelus albocinereus, a stem-galling weevil, was released in 1998 and 1999. Larvae have been recovered from release sites in the Rolleston district, but it is too early to determine if the insect is established.

Carmenta ithacae, a root-boring moth, was widely released in 1998 and 1999. Larvae have been recovered from release sites at Clermont and Wycarba. As yet, it is too early to determine if the insect is permanently established.





Platphalonidia mystica, a stem-boring moth, and *Stobaera coccina*, a sap-sucking beetle, have not become established.

Puccinia abrupta var. *parthenicola*, the winter rust, has established over a wide area from Clermont south to Injune and around Rockhampton. It is generally more active in the southern region. Sporadic outbreaks occur over the cooler months when rainfall is adequate. Higher temperatures may inhibit its establishment further north.

Puccinia melampodii, the summer rust, was released over a wide area from Injune north to Greenvale between 1999 and 2002. It is now established in most districts. However, recent drought conditions have severely reduced its activity.

- ▼ A newly constructed parthenium biocontrol nursery.



Field collection of biocontrol agents

Field collection and redistribution of biocontrol agents is the most cost-effective way of establishing them in new areas. Community involvement in the field collection and redistribution of biocontrol agents can greatly speed up their overall establishment and spread.

To locate collection sites within your area, contact your local parthenium group officers, your local government weeds inspector or the Department of Natural Resources, Mines and Energy Land Protection Officers.

Nursery sites for biological control

For best results with establishment of agents, a nursery site should be developed. This can be done individually or in collaboration with your neighbours or local Landcare group. A nursery site will provide biocontrol agents with green parthenium weed throughout the growing season. This is particularly important during periods of dry weather when the abundance of agents may decline.

A nursery site can provide agents for collection and redistribution to other areas or act as a reservoir. Where possible, nursery sites should be located close to larger infestations of parthenium weed to help agents disperse.

Nursery sites can be maintained by some form of irrigation or be sited in creek flats, gullies or swampy areas that are kept moist by a natural water source such as a spring.

Do not leave isolated patches of parthenium weed for a nursery site, as they will provide a source of seed for further infestation.



Tips for establishing biological control

Zygotomma can be found on the parthenium leaves and stems. Collect by cutting parthenium 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 any one site. *Zygotomma* can take a number of years to establish depending on the occurrence of suitable rainfall.



▲ A parthenium plant grown in a nursery for distributing biocontrol.

Listronotus larvae can be found anywhere in the stem, but especially near soil level. It is necessary to pull up the stems to determine whether *Listronotus* is present. The larvae are 'C' shaped and white. Collect entire infested parthenium plants and leave them 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 gloved hand, and look for the larvae. Collect flower heads or entire plants to leave at a suitable nursery site.

Establish winter rust, *Puccinia abrupta*, by growing cultures under artificially moist conditions and distributing the plants at suitable sites. The nursery should be set up in autumn.

The summer rust, *Puccinia melampodii*, can be established in a similar manner. Nurseries should be functioning during spring and summer.

Epiblema and *Bucculatrix* do not require collection as they have established in all climatically suitable areas.

Conotrachelus albocinereus and *Carmenta ithacae* are not yet present in sufficient numbers to allow for field collection.

Biocontrol agents may fail to establish in some areas, even after well-planned collection and distribution. Repeated releases may be necessary.



▲ Releasing biocontrol agents.



Further information

More information about biocontrol agents, including detailed illustrations, is found in the appendixes.

This information has been reproduced from *Parthenium biological control agents*, a booklet produced in 2003 by the then Department of Natural Resources and Mines, Queensland.

