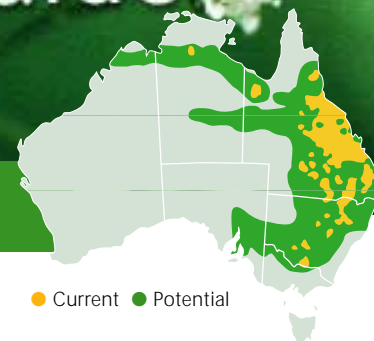


Weed Management Guide

Parthenium weed –
Parthenium hysterophorus



Parthenium weed (*Parthenium hysterophorus*)

The problem

Parthenium weed is a *Weed of National Significance*. It is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts.

Parthenium weed is a major problem in rangelands and summer cropping areas of Queensland. It has a serious impact on the pastoral industry, costing farmers and graziers in Queensland over \$22 million a year in reduced production and increased management costs. Some people suffer severe allergic reactions

to the plant or its pollen; it can cause dermatitis, hay fever and asthma.

Parthenium weed is toxic to cattle, and meat from livestock that eat the weed can be tainted. It also threatens biodiversity in the Einasleigh Uplands bioregion and native grasslands in the central highlands of Queensland.

The weed

Parthenium weed is native to the subtropics of North and South America. It is a fast-maturing annual (or, under certain conditions, a short-lived perennial)

with a deep tap root and an erect stem that becomes woody with age. It may eventually reach a height of 2 m. Its leaves are pale green, branched and covered with soft fine hairs. The small white flowers (4 mm across) have five distinct corners and grow on the stem tips. Each flower produces four or five black wedge-shaped seeds that are 2 mm long with thin white scales.

Its large and persistent soil seedbank, fast germination rate and ability to undergo dormancy make it well adapted to semi-arid environments. It also releases chemicals that inhibit the germination and growth of pasture grasses and other plants.



Parthenium weed matures quickly and produces large quantities of seed (up to 100,000 seeds per plant).
Photo: Larry K. Allain

Key points

- Parthenium weed can germinate, grow, mature and set seed in four weeks.
- Parthenium weed is toxic to stock and contact with parthenium weed, particularly its pollen, can cause allergic reactions such as dermatitis, hay fever and asthma in people.
- The best way to prevent an allergic reaction to parthenium weed is to avoid contact with it, especially breathing pollen from flowering plants.
- Pay close attention to property hygiene. Weed seeds are spread very easily by vehicles, machinery, stock, grain and fodder.
- Use mechanical, chemical and biological control and grazing to manage parthenium weed.



Natural Heritage Trust
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Growth calendar

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

■ General growth pattern ■ Growth pattern under suitable conditions

Parthenium weed normally germinates in spring and early summer, produces flowers and seed throughout its short life and dies in late autumn. However, with the right conditions (rain, available moisture, mild soil and air temperatures), parthenium weed can grow and produce flowers at any time of the year. In a good season, four or five generations may emerge. In summer, if plants are stressed (eg due to lack of water), parthenium weed can complete its life cycle in four weeks. Buried seeds have been found to last much longer than seed on the soil surface, and a significant proportion can still germinate after eight to ten years.

How it spreads

Parthenium weed can produce large quantities of seed, up to 100,000 per plant. More than 340 million parthenium weed seeds per hectare can be present in the surface soil, compared to 120,000 native grass seeds.

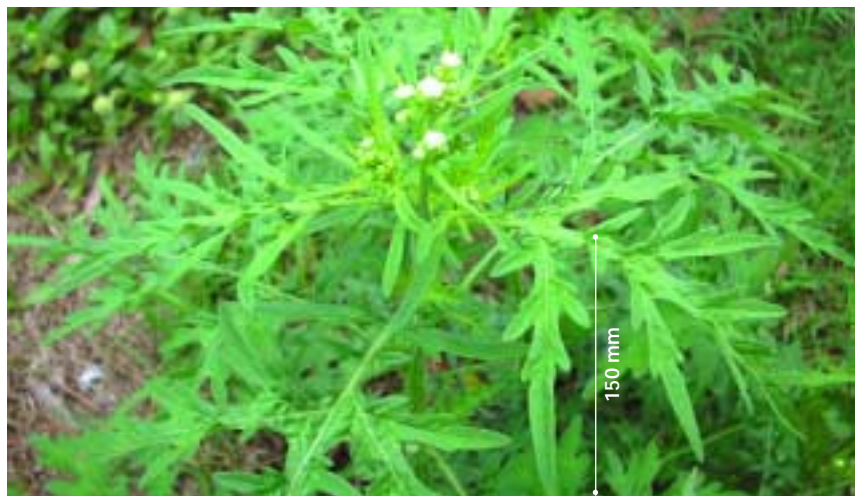
The seed is easily spread by vehicles, machinery and animals, and in pasture seed, stock feed and water. Most long distance spread is in produce, vehicles and farm machinery. It can also be spread by flooding and by animals.

Parthenium weed was first discovered in Queensland in 1955. In a short time it spread from isolated outbreaks to establish core infestations across the Central Highlands of Queensland and into New South Wales and the Northern Territory.

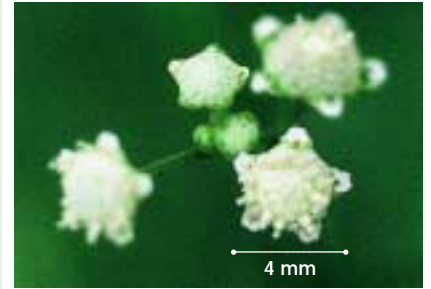
Where it grows

Parthenium weed infests more than eight million hectares of central Queensland with serious outbreaks in the south and north of the state. Outbreaks, many of which have been controlled, have been found throughout New South Wales as far south as the Victorian border.

In Queensland it grows best on alkaline, clay-loam to heavy black clay soils but tolerates a wide variety of soil types. It aggressively colonises areas with poor groundcover and exposed soil such as wastelands, roadsides and overgrazed pastures. It does not usually become established in undisturbed vegetation or vigorous pastures. Drought, and subsequent reduced pasture cover, create the ideal opportunity for parthenium weed to establish. Flooded country is also very prone to parthenium weed distribution and flooded pastures may need to be spelled from grazing to gain their competitive edge.



Parthenium weed can germinate, grow, mature and set seed in four weeks.
Photo: Sheldon Navie



Parthenium weed can flower year round.
Photo: Colin G. Wilson

Potential distribution

Parthenium weed is best suited to areas with an annual summer rainfall greater than 500 mm. Based on climate suitability, it could potentially grow in all mainland states and territories.

What to do about it

Preventing spread into new areas

Preventing the spread of parthenium weed is the most cost-effective management strategy.

There is a high risk of spreading parthenium weed by the movement of vehicles, machinery, livestock, grain and other produce. Queensland has a number of washdown facilities and contractors are required to clean harvesters and other equipment before leaving the state. All harvesters are inspected as they cross the Queensland – New South Wales border.



Property hygiene is also important. Double-check machinery (including the interior of the vehicle) moving onto your property and drive visitors around in your own vehicle. Always wash down vehicles and machinery in the same area to allow easy follow-up control of any seeds that may germinate. Ensure that service provider vehicles (eg telephone, electricity, gas) are free of parthenium weed seed.

Avoid moving cattle in wet weather as they readily transport seed in muddy soil. When new stock arrive on a property, hold them in yards or small paddocks to let seed drop from their coats and tails before releasing them into large paddocks. Always feed stock in the same area to contain weeds imported in contaminated fodder.

When you are buying hay or seed, be aware of what you are buying. In Queensland landowners are required to supply a vendor declaration to state whether their produce is free of parthenium.

Recent experience with parthenium weed

The Queensland Department of Natural Resources and Mines and the Parthenium Action Group have developed management and control techniques for parthenium weed, which include a combination of biological control agents, pasture management, cultivation and herbicides. Small infestations can be eradicated by early detection and monitoring. An ongoing commitment is needed to remove any seedlings and ensure new infestations do not establish. The extent of parthenium weed in New South Wales has been significantly reduced in recent years; all known roadside infestations have been suppressed and all known infestations on private land are under active control. In the Northern Territory, parthenium weed has been eradicated from previous infestations on the Roper River, at Katherine and in the Gulf of Carpentaria. However, although the area infested with parthenium weed is being reduced, the number of new infestations is increasing.



Large parthenium weed infestation in central Qld. Photo: Qld DNRM

Control of new outbreaks

Once parthenium weed has been positively identified, treat isolated patches immediately with herbicides recommended by the local council weeds officer. Watch the area closely for at least seven years as repeated spraying may be necessary to kill new germinations. Don't pull up plants by hand, particularly if they have already set seed. There is a danger that mature seeds will drop off the plant and increase the area of infestation.

Control in pasture...

Control in pasture requires timely herbicide application and pasture management. Conservative stocking to keep a good pasture cover is the best way of controlling large-scale parthenium weed infestations and preventing new infestations in clean areas. Areas where stock congregate, such as watering points, often have low groundcover and are highly susceptible to parthenium infestation. To overcome this problem, establish several stock water points per paddock and rotate stock between them.

Breaking up large paddocks by fencing into single units of similar land type can even out grazing and thus avoid bare patches where weeds can invade. It also allows more flexible management



Parthenium weed's large and persistent soil seedbank and fast germination rate make it well adapted to semi-arid environments. Photo: Colin G. Wilson

strategies, such as spelling pasture and applying herbicide.

...and control in crops

Parthenium weed is becoming a significant problem in crops due to the threat to exports from contaminated grain or other produce. Once in a crop it is very difficult to eradicate, so try to keep crops clean by spraying selective, pre-emergent herbicides where possible and cleaning equipment and machinery such as harvesters. Do not purchase seed that does not comply with the relevant seed Acts. For further information on parthenium weed control in crops, consult your local crop agronomist.

Herbicides

Timing of chemical control is critical. Parthenium weed should be treated when plants are small and have not produced seed, and when grasses are actively growing to recolonise the infested area (eg early summer). Maintaining competition is important for control of parthenium weed, so spraying with a selective herbicide that will not kill other species is recommended. Keep a close watch on treated areas for at least seven years and spot spray isolated outbreaks. A number of herbicides are recommended for parthenium weed control. Contact your local authority for details.

Weed control contacts

State / Territory	Department	Phone	Email	Website
ACT	Environment ACT	(02) 6207 9777	EnvironmentACT@act.gov.au	www.environment.act.gov.au
NSW	NSW Agriculture	1800 680 244	weeds@agric.nsw.gov.au	www.agric.nsw.gov.au
NT	Dept of Infrastructure, Planning and Environment	(08) 8999 5511	weedinfo.ipe@nt.gov.au	www.nt.gov.au
Qld	Dept of Natural Resources and Mines	(07) 3896 3111	enquiries@nrm.qld.gov.au	www.nrm.qld.gov.au
SA	Dept of Water, Land and Biodiversity Conservation	(08) 8303 9500	apc@saugov.sa.gov.au	www.dwlbc.sa.gov.au
Vic	Dept of Primary Industries/Dept of Sustainability and Environment	136 186	customer.service@dpi.vic.gov.au	www.dpi.vic.gov.au www.dse.vic.gov.au
WA	Dept of Agriculture	(08) 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au
Australia wide	Australian Pesticides and Veterinary Medicines Authority	(02) 6272 5852	contact@apvma.gov.au	www.apvma.gov.au

For up-to-date information on which herbicides are registered to control parthenium weed and the best application methods and dosages, contact your state or territory weed management agency or local council. This information varies from state to state and from time to time. Contact details are listed above, including contacts for the Australian Pesticides and Veterinary Medicines Authority, which hosts the PUBCRIS database. This database contains information on all herbicides that are registered for use on weeds in each Australian state and territory.

When using herbicides always read the label and follow instructions carefully. Particular care should be taken when using herbicides near waterways because rainfall running off the land into waterways can carry herbicides with it. Permits from state or territory Environment Protection Authorities may be required if herbicides are to be sprayed on riverbanks.

Mechanical removal

Ploughing the weed in before plants reach flowering stage and then establishing pasture may be effective. Before crops are planted, parthenium weed is normally ploughed in, or pre-emergent herbicides can be used.

Biological control

Biological control of parthenium weed has been investigated in Australia for more than 20 years. Nine insect species and two rusts have been released. Most insects and both rusts have established.

Biological control is one tool that forms part of an integrated management program for large-scale scattered and dense infestations. However, biological control on its own will not eradicate parthenium weed infestations.

The leaf beetle *Zygogramma bicolorata* and the stem moth *Epiblema strenuana* cause the most damage. The beetle emerges in late spring and is active until autumn. The moth is established in all parthenium weed areas. Its larvae (grubs) feed inside the stem, stunting the plant's growth and reducing its competitiveness and seed production. Other species are: a stem boring weevil from Argentina,

Listronotus setosipennis, which is having limited success; a seed-feeding weevil, *Smicronyx lutulentus*, which lays eggs in the flower buds, leaving the newly hatched grubs to feed on the seed heads; a leaf mining moth, *Bucculatrix parthenica*, from Mexico, whose grubs feed on the leaves of parthenium weed; a stem-galling weevil, *Conotrachelus albocinereus*, from Argentina, which is still becoming established; and *Carmestia ithacae*, a stem boring moth from Mexico released from quarantine in 1999 and still becoming established in the Central Highlands.

Seasonal conditions and the need for green plants for insect survival play a major role in the effectiveness and abundance of biological control agents. This is highlighted during long dry periods



The leaf beetle *Zygogramma bicolorata* emerges in late spring and is active until autumn. Photo: Rachel McFadyen

when insect populations are reduced and need time to recover.

Puccinia abrupta, a winter rust from Mexico, infects and damages leaves and stems. It is established over a wide area in Queensland, south from Clermont. The release program for a second rust, *Puccinia melampodii*, a summer rust, began in 1999 and is continuing. Its establishment has been hindered by drought but further releases have been made in some areas following better rainfall. Its impact is expected to improve if rainfall increases



The leaf beetle *Zygogramma bicolorata* can remove virtually all of parthenium weed's foliage. Photo: Rachel McFadyen

in the areas infested with parthenium weed. The rust weakens the plant by damaging the leaves over the summer growing season.

Field collection and distribution of biological control agents will help reduce local parthenium weed infestations. For best results a nursery site to raise biological control agents should be developed. Good nursery sites can be as simple as a leaking pipe or tank. Other ideal sites are infested black soil creek flats, gullies or swampy areas. At the same time, ensure that your nursery site does not become a source for further parthenium



The distinctive branched leaves are covered with soft, fine hairs.
Photo: Sheldon Navie

weed infestations. Contact your state/territory weed management agency or local council for assistance in collecting and rearing biological control agents for parthenium weed.

Burning

Burning is not a useful control strategy for parthenium. However, research suggests that burning for other purposes (eg woody weed control) will not result in an increased infestation of parthenium so long as the pasture is allowed to recover before stock are introduced. Stocking of recently burnt areas known or suspected to contain parthenium weed decreases competition, ultimately creating a more serious infestation. Permits may be required to burn, so check with your state/territory weed management agency or local council.

Legislation

Parthenium weed is declared a noxious weed in all mainland states and territories, and landowners are required to control it.

Its introduction into Australia is prohibited. Legislation introduced into Queensland recently makes it a legal requirement for suppliers of stock, machinery, soil, water or other products likely to transport weed seeds to complete a declaration stating whether or not the material is clean of parthenium weed. In New South Wales landowners must report the presence of parthenium weed to the local control authority within three days. This agency will then advise the necessary action to be taken to eradicate the infestation.

Acknowledgments

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Maps: Australian Weeds Committee.

...case study

Management of parthenium weed at Mt Panorama

While parthenium weed is certainly something landholders should try and prevent invading their properties, it can be managed. This is the message from Gail Godwin Smith, project officer with the Parthenium Action Group. Gail and her husband Howard Smith are farmers and graziers at Rolleston in central Queensland.

In 1988, when Howard and his family bought 'Mt Panorama', it was infested with parthenium weed. Today, they regard the weed as an indicator species which appears if pasture is being overgrazed.

'Mt Panorama' has been a trial property for the release of biological control agents, two of which (the *Zygogramma* beetle and summer rust) have had a big impact on the weed.

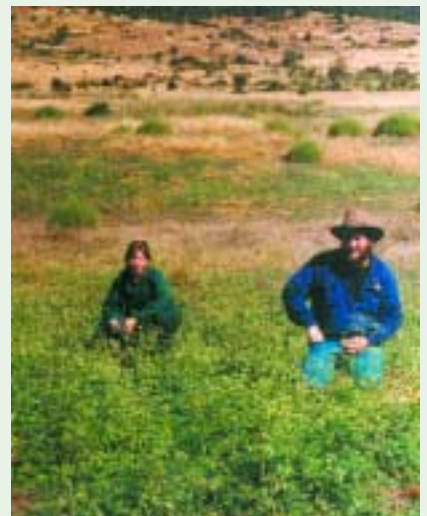
However, changing management practices has been the major factor in controlling parthenium, says Gail. The main infestations on the property now occur along waterways. Many of these waterways have been fenced off to allow native vegetation to compete with parthenium and they are grazed seasonally to reduce any fire risk.

Favourable seasonal conditions allow spelling of paddocks and rotation of cattle so that healthy pasture is maintained and no one paddock gets eaten out.

Parthenium weed is no longer a problem on the cultivated country either, where minimum tillage is used and pre-emergent herbicide sprayed for other weeds.

The Smith family recognise that they are unlikely to totally eradicate parthenium

weed, and so they must live with it and manage it appropriately.



Changing management practices has been the major factor in controlling parthenium weed on 'Mt Panorama'.
Photo: Qld DNRM

How to control parthenium weed

Quick reference guide

Prevention

Maintaining good hygiene on your property can prevent the spread of parthenium weed seed – check vehicles and machinery moving onto the property, drive visitors around in your own vehicle and always wash down vehicles and machinery in the same place. Always feed stock in the same area to contain weeds carried in contaminated fodder and place new stock into a small holding paddock until seed has dropped from their coats and tails.

New outbreaks

Treat immediately with a herbicide recommended by the local council weeds officer. Apply herbicides when plants are actively growing and before they set seed; keep a close watch on treated areas for at least seven years. Spot spray one to two weeks after



The stem moth, *Epiblema strenuana*, is established in all parthenium weed areas. Photo: Rachel McFadyen

rain, when plants are large enough to see but before they produce seed.

In pasture

Stock conservatively to keep a good pasture cover, which will help prevent invasions of parthenium weed. Some strategies to improve pasture competition are to: spell pastures in the growing season, use rotational grazing, and spray herbicide to encourage grass seed production and reseeding.

To overcome high grazing pressure points, establish several stock water points per paddock and rotate stock between them.

Fencing different land types enables better grazing management.

In crops

Keep crops free of parthenium weed by spraying selective, pre-emergent herbicides where possible and cleaning equipment and machinery such as harvesters.

Biological control

Researchers in Queensland have located and tested a number of biological control agents against parthenium weed. Landowners can collect and distribute biological control agents to help reduce local infestations.

Control options

Type of infestation	Chemical	Biological	Physical	Pasture management	Mechanical
Light – few plants, over a small area	Spot spray before seeds set.	Not suitable.	Hand pulling is not recommended because of the health risks associated with parthenium weed. Use strategic fencing to separate different land types and improve grazing management.	Maintain good pasture cover by not overgrazing.	Some landholders have achieved success by ploughing in parthenium weed in the rosette stage before it seeds, but this must be followed up by sowing a crop or direct seeding perennial pasture.
Medium – plants over a medium area	Spray before seeds set.	Release biological control agents.			
Heavy – large number of plants	Spray before seeds set.	Establish a nursery site for biological control agents if possible.			

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