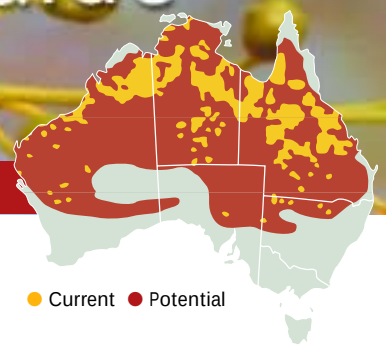
Weed Management Guide

Parkinsonia – *Parkinsonia aculeata*



Parkinsonia (*Parkinsonia aculeata*)

The problem

Parkinsonia 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.

Parkinsonia threatens rangelands and wetlands around Australia. If left untreated, it displaces native vegetation and reduces access to land and waterways.

Economic costs to landholders stem from an increased difficulty in mustering stock, a reduction in stock access to watering points and a decrease in primary production of grasses that are replaced by parkinsonia. Additionally, parkinsonia infestations provide refuges for feral animals, especially pigs.

The environmental impacts of parkinsonia are numerous. Native plant species are replaced, leading to lower quality habitat for animals. Wetlands are particularly vulnerable because parkinsonia can dam watercourses, cause erosion, lower watertables and take over vast tracts of floodplain. Threatened areas include national parks and other regions of high aesthetic, indigenous and tourist value.

The weed

Parkinsonia can grow to 8 m, although smaller plants are more common. It can be single- or multi-stemmed. The smooth, green stems are slender and tend to droop and zig-zag. Its leaves are quite different to the ferny leaves of the three other prickle bushes (see back page). Parkinsonia leaves consist of a flat, green leaf stalk up to 300 mm long and 2–3 mm wide with numerous small (4–10 mm) green oblong leaflets staggered along both sides. The leaf base is protected by sharp, recurved spines, 5–15 mm long, which persist in older branches.

Parkinsonia flowers are about 20 mm across, with four yellow petals and one erect orange or orange-spotted petal. Seed pods (30–130 mm long) are straight with bulges around seeds and points on both ends, and are straw-brown when ripe. They generally contain 1–4 seeds, but occasionally up to 11. Seeds are olive-green to brown and oblong-shaped (10 mm by 4 mm). The roots are generally shallow.

Parkinsonia produce up to 5000 seeds per year: Alroy Downs, in the Barkly Tablelands, NT.
Photo: Colin G. Wilson

Key points

- Parkinsonia is one of four prickle bushes that are weeds throughout semi-arid Australia. (See the back page for more information.)
- Dense infestations around watercourses prevent stock from accessing water and hinder mustering.
- Parkinsonia control is expensive – prevention of spread is more cost-effective.
- Control must be tailored to suit the landscape:
  - In rangelands use blade ploughing in the early dry season.
  - On riverbanks, chemicals should be applied to individual trees.
  - Fire may also be a good control option.
- Follow-up will be required to control seedlings.

Natural Heritage Trust
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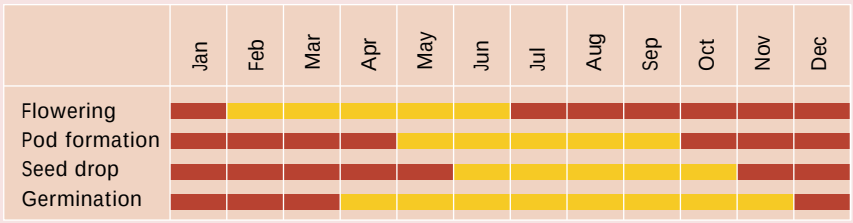
Growth calendar



There is a lot of variation in the timing of flowering and fruiting in parkinsonia across Australia, and therefore the growth calendar may vary in different areas. The general pattern is that flowering occurs in the warmer months after winter and seed pods develop soon afterwards. The seed pods ripen and drop some three to four months after flowering. However, established trees can have a few flowers and/or fruit at any time of the year.

Parkinsonia seeds germinate in response to prolonged (at least several days) moisture. Although they can germinate year round, most germination occurs during the hot, wet season, which may vary between sites and between years. Some seeds will germinate soon after being dropped, while others can remain dormant for several years. The seedling emerges as a single thorny stem and flowering first occurs in its second or third year.

Parkinsonia's five-petalled flower always has a single orange, or orange-spotted, erect petal and four yellow petals.
Photo: Colin G. Wilson

How it spreads

Parkinsonia reproduces by seeds. Mature trees typically produce about 5000 seeds per year, but can produce in excess of 13,000. The pods float and can be carried large distances downstream from upper catchment infestations, especially during floods. Seed can also be moved away from the parent plant in mud attached to animals or machinery. The pods are relatively unpalatable, so spread by animals consuming the seed is not very likely.

Parkinsonia was first introduced into many areas around Australia from Central America in the late 1800s. It was used for hedges and was also planted around homesteads and watercourses as an ornamental and shade tree. It is now naturalised across much of northern Australia.

Where it grows

Parkinsonia can thrive in a wide range of conditions. It occurs in climates varying from the moist sub-humid tropics to the harsh arid interior. It especially thrives around watercourses such as drainage lines, dams, rivers and bores. However, it can potentially invade uplands that are never inundated, floodplains and areas of run-off, and form dense thickets in all regions. Although it grows best on clay, it is found on a wide variety of soils.

Parkinsonia has been introduced into many regions worldwide, including Hawaii, tropical Africa, India, Pakistan, the Middle East, Italy and Cyprus. In Australia infestations occur mainly throughout coastal, central and western Queensland, central and northern Northern Territory, and the Kimberley and Pilbara regions of Western Australia. Small outbreaks have also been recorded from isolated areas of South Australia and far western New South Wales. At least 800,000 ha of land is now infested with parkinsonia.

Potential distribution

Based on the suitability of climate, all mainland states and territories except Victoria and the Australian Capital Territory are suitable for widespread parkinsonia infestation. It has naturalised in most, but not all, climatically suitable catchments, and its distribution within many of those catchments is likely to increase.

What to do about it

The economic costs of control are high once parkinsonia becomes established. The prevention of spread within and between catchments, early detection and control of small manageable outbreaks are thus high priorities when considering management strategies.

How to prevent the spread of parkinsonia

Soil or sand which could contain parkinsonia seeds should not be removed from infested areas. Any transport or machinery used in infested areas should be thoroughly cleaned before moving to other areas. Because water is responsible for much of the spread of parkinsonia, outbreaks on watercourses, particularly in upper catchments, are a priority for control.

Seed pods generally contain 1-4 seeds and ripen at the end of the wet season.
Photo: Colin G. Wilson

Preventing spread into uninfested catchments

The highest priority parkinsonia outbreaks are those that occur in catchments where it is not widespread or has not been previously found. These outbreaks have the greatest potential to cause damage. Such areas include the Lake Eyre and Murray–Darling basins, the Cape York region, parts of the Barkly Tablelands and southern regions of Australia.

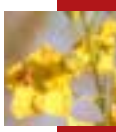
Controlling existing infestations

If the spread of parkinsonia is not carefully managed, it can form dense stands that exclude all other forms of vegetation. Research into parkinsonia control commenced in the 1950s and has been ongoing. The results from this research have shown that seedlings are particularly susceptible to different forms of control, especially fire, drought or inundation, soon after germination. An integrated approach using several weed management techniques (eg mechanical and chemical control, fire) is the most effective way to deal with dense infestations of parkinsonia. However, the characteristics of the infestation (eg size, density, location, position within the catchment) and the availability of resources will determine the exact course that control should take.

Infestations, such as in the Gulf country in northwestern Qld, restrict access and are expensive to control.
Photo: Cathy Lockett

Target watercourses, especially in upper catchments

Infestations along watercourses, especially in upper catchments, are the highest priority for parkinsonia control, as these have the greatest potential to infest new areas and replenish previously controlled areas with new seeds.



Parkinsonia was originally planted as shade trees in places such as Rockhampton Downs in the NT.
Photo: Colin G. Wilson

Mechanical control is effective…

Small parkinsonia plants can be relatively easily removed by manual means (hand pulling or grubbing with a mattock). Larger plants can be bulldozed, stickraked, blade ploughed or chain pulled. The roots must be removed to a depth of about 200 mm to prevent regrowth. In general, mechanical control of large infestations is more cost-effective than chemical control. Tree clearing permits may be required if native species are to be affected by mechanical control.

Blade ploughing gives excellent kill rates and is effective in treating large, thick infestations. Chain pulling kills mature trees, but many smaller plants are just bent over and straighten up once the chain has passed over.

The best time to attempt mechanical control is when the infestation first becomes accessible to heavy machinery at the start of the dry season. There should still be enough moisture in the soil to allow the roots to be easily removed, and the dry period following control will further stress any damaged plants and prevent immediate germination of seeds from the seedbank.

If the roots are not removed, parkinsonia can reshoot, producing multiple stems from the base. These multi-stemmed plants are actually more resilient and harder to remove.

…but requires follow-up control

Mechanical control is not generally suited to uneven ground, and is not advised for controlling parkinsonia along river banks due to the potential to cause erosion and damage non-target species. Because seedling germination in areas where the ground has been disturbed by mechanical control can be prolific, follow-up chemical or careful mechanical control will be required to treat seedlings or any surviving adult plants. Where feasible, cultivation and sowing of a suitable perennial pasture will reduce parkinsonia regrowth.

A range of herbicides and methods of chemical control are suitable for parkinsonia

There is a wide range of herbicides registered for parkinsonia control, with several different application methods. Herbicides are useful for controlling dense high priority infestations but otherwise may be too expensive for widespread use.

Complete overall (foliar) spraying provides effective control for seedlings that are less than 2 m tall and actively growing. Aerial application by helicopter provides similar results.

Larger trees can be treated with a liquid or granular herbicide applied near the roots just prior to the wet season in northern Australia. Note that these residual herbicides can also affect nearby non-target species.

Mechanical control with an Ellrott front-mounted bladeplough.
Photo: John McKenzie

Weed control contacts

State / Territory	Department	Phone	Email	Website
NSW	NSW Agriculture	1800 680 244	weeds@agric.nsw.gov.au	www.agric.nsw.gov.au
NT	Dept of Natural Resources, Environment and the Arts	(08) 8999 4567	weedinfo.nreta@nt.gov.au	www.nt.gov.au
Qld	Dept of Natural Resources and Mines	(07) 3896 3111	enquiries@nrm.qld.gov.au	www.nrm.qld.gov.au
SA	Dept of Water, Land and Biodiversity Conservation	(08) 8303 9500	apc@saugov.sa.gov.au	www.dwlbc.sa.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 parkinsonia 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.

Chemical control near waterways

Basal bark and cut-stump treatments generally provide more effective control than foliar spraying. Although they are more time consuming they are the main methods recommended for use near waterways, as foliar applied herbicides can drift onto non-target plants or into water.

When applying the basal bark technique to stems up to 150 mm diameter, drench the herbicide around the trunk to a height of 300 mm above the ground. For larger trees spray up to 1 m above the ground. Before spraying ensure that the bark is dry and clear of dirt or debris as this will reduce the effectiveness of the treatment. For best results soil should be moist and plants should be actively growing.

When using the cut-stump technique, be sure to swab the entire cut surface of the stump immediately after cutting as this ensures that the herbicide reaches the roots.

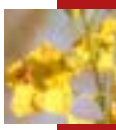
Helicopter spraying of a large infestation in central Qld.
Photo: John McKenzie

Fire offers much potential

Fire kills seedlings and seeds on the surface and is an excellent form of follow-up control after mechanical or chemical control. With mature plants, however, the results are mixed. Although fire in its own right offers excellent potential to control mature plants, little is known about the timing or conditions that are required to get good kill rates. In some cases only the above-ground vegetation is killed and the plant regrows from many stems at the base. The Queensland Department of Natural Resources and Mines is currently researching which fire regimes give maximum kill rates of mature parkinsonia in central Queensland.

As long as intense fires can be generated, it is expected that fire on its own will become an important method of controlling parkinsonia in the future. As for other weed species controlled by fire (eg mimosa, mesquite, rubber vine), fuel to increase fire intensity can be provided by reduced grazing, which allows grasses to build up, or by mechanically or chemically killing a small amount of the weed and using that as fuel. Dry windy conditions are best for generating hot fires.

One of the advantages of fire is that it is relatively inexpensive. However, it must be managed carefully to prevent loss of stock and property, and minimise the effects on other vegetation and the potential for erosion when heavy rain follows soon after burning. Permits may be required to light fires; check with your local council or state/territory government agency.



Parkinsonia undergoing seasonal inundation in central Qld.
Photo: Cathy Lockett

Biological control is not yet effective

A biological control program for parkinsonia has been under way since 1983 in a joint study by the Queensland, Western Australian and Northern Territory governments. Three insects have been released so far into parkinsonia infestations. While all have established, impacts on the weed do not appear to be significant. One species, the seed feeding beetle *Penthobruchus germaini*, killed large proportions of seeds soon after it was first released in central Queensland. However, the beetle's eggs are now being attacked by a native wasp and it is no longer having an impact on parkinsonia. The CSIRO is currently conducting surveys in Central America to see if more potential biological control agents are available.

Grazing management systems

Cattle only consume parkinsonia when no other feed is available. Therefore, this is not a suitable management technique because it would cause severe environmental damage through the loss of other vegetation. Recently, a few landholders have grazed camels on parkinsonia, with some success in terms of reduction of growth and seed production. Wallabies also selectively graze the seedlings and small plants in some areas.

The benefits of long-term planning

Control of parkinsonia is difficult, expensive and requires ongoing commitment. However, the benefits include recovered pasture, increased production, reduced mustering costs, and the protection of natural ecosystems, plants and animals. The short-term costs of control will probably exceed the short-term benefits. For this reason, weed management needs to be integrated into the long-term property management plan.

Parkinsonia has green stems, which allow it to continue growing even with no leaves.
Photo: Colin G. Wilson

Legislation

In Queensland, the Northern Territory, Western Australia, South Australia and New South Wales, landholders are required by law to contain parkinsonia within dense infestations and eradicate all smaller outbreaks. Check with your local council or state/territory government agency about its requirements for parkinsonia control.

Acknowledgments

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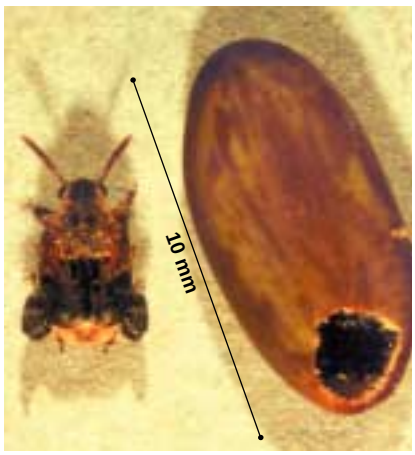
Maps: Australian Weeds Committee with additional data from Lands Protection, Qld DNRM.



The biocontrol agent *Penthobruchus germaini* feeds on parkinsonia seeds.
Photo: Cathy Lockett

...case study

Pastoralism and parkinsonia on the Barkly Tablelands in the Northern Territory

The Barkly Tablelands is a large (275,000 km^2) cattle grazing region to the northeast of Tennant Creek in the Northern Territory. The tablelands are naturally tree-less, and parkinsonia was planted as a shade tree around homesteads in the late 1800s – early 1900s. It is now the most serious weed in the region, particularly along watercourses and around bores, where it stops cattle from watering and hinders mustering activities.

A concerted effort to control parkinsonia in the Barkly Tablelands was undertaken in 2000–01 as part of a project jointly funded by the Commonwealth Government's Natural Heritage Trust and landholders. Landholders worked together with regional weeds officers of the Northern Territory Department of Infrastructure, Planning and Environment and an external contractor to eradicate as many infestations as possible. Follow-up control was funded by landholders.

Because the spread of parkinsonia is due in part to seeds being carried downstream during floods, upstream infestations were targeted first for control. Nuisance plants around stock watering points were also removed.

Herbicides were most commonly used to control parkinsonia, with basal bark application the most favoured technique. This provides rapid control and there are no impacts on non-target species, but follow-up control must be undertaken in the following year as seedling germination is prolific. Control was undertaken when the infestations were accessible in the dry season, either by quad bike or 4WD.

Soil-applied granular herbicides have also been used. These are residual and can control seedlings for several years. Disadvantages include the reliance on rainfall to activate the herbicide, and impacts on grasses that could otherwise shade out parkinsonia seedlings, especially if the grasses are left ungrazed.

Despite early successes, biocontrol is not currently effective in helping control parkinsonia. Continual follow-up, using an integrated approach, will be required to stay on top of the weed in the Barkly.

Measuring the effectiveness of biological control agents in the Barkly Tablelands in January.
Photo: Jonathon Peart

How to control parkinsonia

Quick reference guide

When to treat parkinsonia

Chemicals should ideally be applied when the plant is actively growing, generally in the hot, wet season.

Mechanical control is more suited to the early dry season, ideally as soon as the infestation becomes accessible, when roots can be pulled easily. The extended dry season following control places further stress on treated plants and minimises germination.

The best control method depends on habitat

Rangelands, especially level areas, are well suited to mechanical control such as blade ploughing. Seedling germination of parkinsonia is often prolific following mechanical control, and follow-up work will therefore be required.

However, mechanical control can cause bank erosion and damage to non-target species around waterways. Here, individual trees should be targeted for chemical control with either the basal bark or cut-stump technique. Foliar spraying with chemicals is not recommended near waterways.

Fire, already known to be effective against surface seeds and seedlings, is being further investigated for controlling mature parkinsonia.

Follow-up control

Numerous seedlings will germinate after initial control efforts. Follow-up control could include either mechanical or chemical treatment or fire. Seeds can probably remain viable for ten or so years, so follow-up work is an ongoing concern that needs to be incorporated into any weed management plan.

How to identify the prickle bushes

Parkinsonia is one of four prickle bushes that are yellow-flowering, seed pod forming, woody weeds of northern Australia. The Queensland Department of Natural Resources and Mines produces a Fact Sheet (PP40) titled 'Identification of Prickle Bushes' which clearly outlines the distinguishing characteristics of each prickle bush. Parkinsonia can be distinguished by its distinctive green, flattened leaf stalks with green, oblong leaflets and straight straw-coloured seed pods with long thin constrictions. The following table summarises the fact sheet.

Feature	*Mesquite *Prosopis* spp.	Mimosa bush *Acacia farnesiana*	Parkinsonia *Parkinsonia aculeata*	*Prickly acacia *Acacia nilotica*
Pod size and shape	Up to 200 mm, very slight constrictions between seeds	Up to 60 mm, cigar shaped, slightly curved	Up to 100 mm, straight, long thin constrictions between seeds	Up to 230 mm, large constrictions between seeds
Pod colour, hairiness	Straw coloured, sometimes purple; no hairs	Brown to black; no hairs	Straw coloured; no hairs	Grey-green; fine hairs
Flowers	Greenish cream – yellow 'lambs tail' cylindrical flower spike, 50–80 mm	Golden yellow, ball shaped, 10 mm across	Four all yellow petals and one erect petal, either orange or yellow with an orange spot	Golden yellow, ball shaped, 10 mm across
Leaves	Fern-like, paired (1–3 pairs, often with a gap between leaves)	Fern-like, paired (2–4 pairs with a gap between leaves)	Narrow, flat, paired (1–3 pairs) green leaf stalks with small green oblong leaflets	Fern-like, paired (3–10 pairs at each point along the stem)
Bark	Young: smooth dark red–green Mature: rough grey	Grey with prominent white spots	Smooth and green, straw coloured at base of older trees	Young: a tinge of orange and/or green Mature: dark, rough
Tree shape and size	Untidy spreading tree, up to 15 m, single or multi-stemmed	Rounded shrub to 3 m, usually multi-stemmed	Shrub or small tree to 8 m, single or multi-stemmed	Spreading tree to 10 m, usually single-stemmed

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* See other guides in this series on these *Weeds of National Significance*.

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