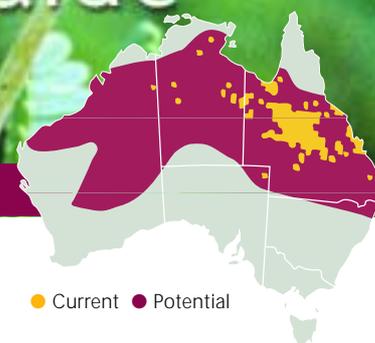


Weed Management Guide

Prickly acacia – *Acacia nilotica*



Prickly acacia (*Acacia nilotica*)

The problem

Prickly acacia 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.

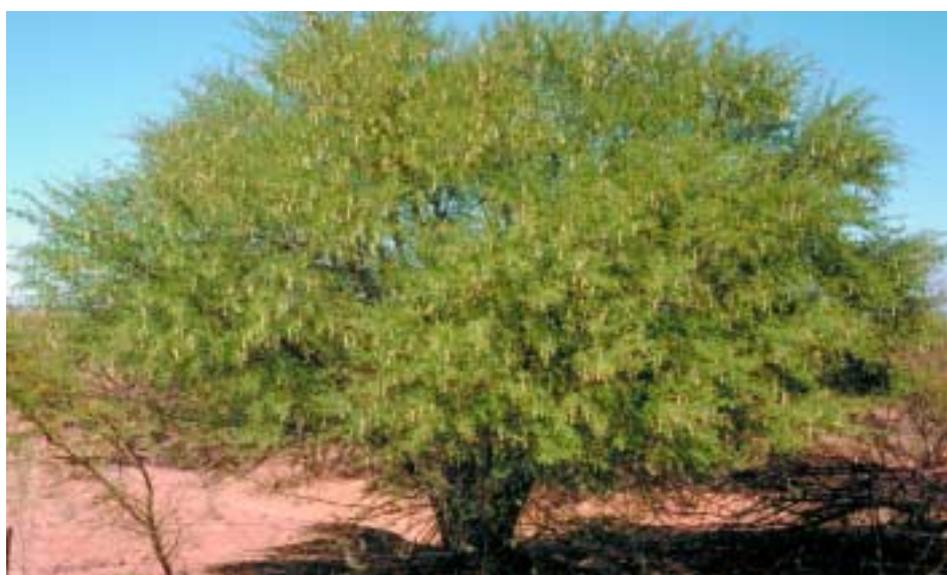
At present over 6.6 million ha of arid and semi-arid Queensland are infested with prickly acacia, mainly in the Mitchell Grass Downs. Prickly acacia could potentially infest vast tracts of grasslands and woodlands throughout Australia.

The economic impacts of prickly acacia on Queensland's grazing industry are estimated at \$5 million per year. Even at medium densities, it halves the primary productivity of grasslands, interferes with stock mustering and restricts stock access to water. Control costs considerably outweigh its benefits as a shade tree and drought fodder.

Prickly acacia dramatically alters the ecological balance of grasslands and thereby threatens biodiversity, particularly in the Mitchell Grass Downs in Queensland, home to 25 rare and threatened animal species and two endangered plant communities. Infestations also have an impact on tourism and land use by indigenous people.

The weed

Prickly acacia is a small, thorny, spreading tree generally growing to about 4–5 m high and occasionally to 10 m. It is usually



Prickly acacia in full fruit near Hughenden, Qld, in August.
Photo: Colin G. Wilson

single stemmed. The bark of young trees has a tinge of orange and/or green. Older trees have dark, rough bark and tend to lose most of their thorns. The green, fern-like leaves are 30–40 mm long. Each leaf is made up of 10–25 pairs of very small (3–6 mm) leaflets along its length. A pair of stout spines, 10–50 mm long, grows at the base of each group of leaves in young stems.

Fluffy round clusters of golden yellow flowers, 10 mm in diameter with 20 mm stems, occur in groups of 2–6 at the leaf base. The seed pods are grey-green, covered in fine hairs and generally 100–200 mm long. The characteristic constrictions between each seed in the seed pod is reminiscent of a strand of pearls. The deep taproot also has several branches near the surface.

Key points

- Prickly acacia is one of four prickly bushes that are weeds throughout semi-arid Australia. (See the back page for more information.)
- It now covers large tracts of Queensland's grasslands and also infests watercourses and woodlands.
- Preventing spread (eg by quarantining cattle) is the most cost-effective way of managing prickly acacia.
- Chemical and mechanical control can be integrated with fire, grazing management and biological control to combat prickly acacia.



Growth calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering			■	■	■	■						
Pod formation							■	■	■	■	■	■
Seed drop	■											
Germination	■	■								■	■	■
Leaf fall						■	■	■	■	■	■	■

■ General growth pattern

Prickly acacia germinates following rainfall in the wet season. Although 95% of seed is dead after two years, some seeds may still germinate up to 15 years after seed drop. Germination is aided when seeds are disturbed, eg by fire or by passing through the digestive system of animals. Seedlings grow rapidly near water but more slowly in open grasslands. Trees can flower and fruit two to three years after germination, and more quickly after high rainfall years.

Prickly acacia flowers between March and June, with pods forming between July and December. Most leaf fall corresponds to this dry period between June and November. Seed pods drop from October to January.



Prickly acacia seed pods are characteristically heavily constricted between seeds.

Photo: Colin G. Wilson

How it spreads

Although capable of regenerating from cut stumps, prickly acacia only reproduces by seeds. A medium-sized tree in a well watered environment can produce as many as 175,000 seeds per year.

Seeds may be washed downstream in fast flowing water, but long distance spread in Australia is mainly attributed

to consumption of seeds by cattle, which readily eat the nutritious, ripe seed pods. At least 40% of the seeds consumed in this way are viable after being excreted, which is normally up to six days after consumption. Manure assists germination by providing extra moisture and nutrients. Cattle spread viable seeds more effectively than either goats or sheep, which tend to chew the seeds.

Prickly acacia first spread widely in Australia in the early 1900s, when it was planted as a shade and ornamental tree in the Bowen and Rockhampton districts of Queensland. In 1926 the Queensland Department of Agriculture recommended planting prickly acacia for shade and



Spines can be up to 50 mm long and tend to drop off older stems.

Photo: Colin G. Wilson





A dense roadside infestation in West Timor, Indonesia.
Photo: Colin G. Wilson

fodder for sheep in western Queensland. However, the introduction of cattle into the area, and good wet seasons in the 1950s and 1970s, contributed to an explosion in the abundance and range of prickly acacia throughout the Mitchell Grass Downs of central and western Queensland.

In good seasons prickly acacia can produce 175,000 seeds

Scattered infestations have been found along the Queensland coast between Bowen and Maryborough, the Barkly Tablelands and Arnhem Land in the Northern Territory, Cordillo Downs Station in northeastern South Australia and the southeastern Kimberley Ranges in Western Australia.

Where it grows

Prickly acacia grows best on cracking clay soils that have high water holding capacity, but can also grow on sandy soil in areas of higher rainfall. It grows best around waterways and on seasonally inundated floodplains receiving 350–1500 mm of annual rainfall. In its native environment prickly acacia is found in the tropics and subtropics of Africa (Ethiopia, Somalia) through to Pakistan, India and Burma.

Potential distribution

Based on climate, prickly acacia could potentially invade most of northern Australia, including the majority of Queensland and the Northern Territory, and much of Western Australia.

What to do about it

As with all weeds, it is clear that prevention of introduction is the most cost-effective strategy for dealing with

prickly acacia. However, despite extensive control efforts since 1957, the weed is very well established in Queensland. Recent control efforts have centred on the spread of prickly acacia into vulnerable river systems, where the Queensland Department of Natural Resources and Mines is working in conjunction with local councils and landholders.

If left unchecked, prickly acacia could spread across most of northern Australia

The Prickly Acacia Management Group, representing industry, landcare, local government, conservation, landholder, government and research agencies, was formed in 1998 to implement a national strategy; in 2001 this group was superseded by the National Prickle Bush Management Group. The National Prickly Acacia Containment Line was defined in 1999 to prevent spread outside of the line and minimise impacts within it. Prickly acacia has since been controlled in South Australia and most of the Northern Territory, while some success within the containment line has also been achieved.



Dense prickly acacia – Richmond area, northwestern Qld.
Photo: Nathan March





Prickly acacia infestations in the Julia Creek area, northwestern Qld, threaten the endangered Julia Creek dunnart, *Sminthopsis douglasi*, and other carnivorous marsupials.
Photo: Nathan March

Eleven management practices to limit the spread of prickly acacia

The Queensland Department of Natural Resources and Mines has developed 11 management strategies aimed at limiting the spread of prickly acacia. These suggestions include:

- mapping infestations
- eliminating prickly acacia near waterways
- replacing open bore drains with piped water
- targeting small infestations and seeding trees for control first
- restricting grazing of seeding trees
- fencing to contain infestations
- running sheep instead of cattle in prickly acacia infested paddocks
- quarantining sheep and cattle before transport
- keeping infestations manageable
- not overgrazing
- providing feeding supplements after prickly acacia is removed.

Control works best with an integrated approach

Control of prickly acacia can be achieved with an integrated approach using mechanical, chemical and biological methods. Fire and pasture management can complement these treatments in some instances. Some of the variables that must be considered when determining an appropriate control method are: location, size and density of infestation, landform, timing of control, availability of resources, management objectives and grazing frequency and timing.

There are numerous mechanical control methods

Mechanical control should be conducted before the seed pods are dropped, and will be particularly effective during drought because seedling regrowth is minimised. The cost of mechanical methods, generally between \$20 and \$40 per ha, is partially offset if the cleared prickly acacia is used as fodder, especially helpful in drought conditions. Permits may be required if native plants

are affected – check with your local council or state or territory weed management agency.

There are several mechanical methods suitable for removing prickly acacia. Large areas with a scattered to medium density of trees with trunk diameters less than 150 mm can be grubbed, cutting the root to at least 300 mm below the soil surface to prevent regeneration. Wheeled tractors of around 80 hp fitted with a scoop or grubbing attachment are required. Pushing and stickraking of prickly acacia are suited to large areas of medium-density infestation.

Chaining, or double-chain pulling, is especially useful for larger trees (greater than 40 mm trunk diameter) in established very dense stands of prickly acacia. Chaining is best suited to the second year of drought or before the first seed pod drop following drought. Chaining is not recommended for drainage channels or waterways due to the likelihood of seedling regrowth. All forms of mechanical control will require follow-up to check for regrowth. Mechanical and chemical control are both suitable as follow-ups.

Chemicals are most effective during the growth season

There are several options for the chemical control of prickly acacia. Chemicals are most effective after the wet season when soil moisture is still high.

The basal bark spray method is suitable for stems up to 100 mm in diameter. The stem should be sprayed completely around the base up to a height of 300 mm above ground, wetting the bark to the point of run-off. Larger trees can be controlled by extending the spraying to 1 m above ground. Basal bark spraying is most effective between April and August.

The cut-stump technique may be used at any time of the year. Stems should be cut horizontally as close as possible to the ground and immediately painted or sprayed with herbicide.



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 prickly acacia 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.



To kill prickly acacia, apply herbicides within ten seconds of cutting the stump: prickly acacia field day in northwestern Qld.
Photo: Nathan March

Foliar, or overall, spraying is effective on seedlings and young plants up to 2 m tall as a follow-up to other forms of control. Soil-applied herbicides placed as close to the trunk as possible can also be highly effective, especially when applied before rainfall (ie October–November for central Queensland).

Infestations in irrigation channels (bore drains) can be targeted by first emptying the channel or drain of any water.

Herbicide is then sprayed in a 1 m wide strip along the length of the channel. Several days should be allowed for the herbicide to bond to the mud, and then water should be slowly returned to the channel. Channels should not be used to supply water for domestic or agricultural purposes for 7–14 days afterwards. All forms of chemical control will require follow-up treatment to kill seedlings for several years following initial treatment.

Fire can supplement mechanical or chemical control of seedlings

Fire is effective against prickly acacia seedlings but mature trees are highly fire resistant. Therefore, if there is sufficient fuel available, fire can be a useful tool to control seedlings when germination is prolific. However, there are other considerations, such as the sensitivity of Mitchell grass to burning and the potential for damage to stock and infrastructure, that must also be balanced against the weed control provided. Permits may be required to light fires – check with your local council or state or territory weed management agency.

Do not overgraze following control efforts

Once control has been initiated, the country should not be overgrazed. Although some stock – particularly sheep and goats – can help control the regrowth of seedlings, if perennial grasses are overgrazed there is less competition for the prickly acacias, which then thrive.

The quarantining of animals from infested areas before transportation is another important grazing management initiative because the main source of new





Flowering takes place between March and June. Flowers occur on 20 mm long stems at the leaf base.
Photo: Colin G. Wilson

infestations is seeds distributed in the dung of stock. Six days of quarantine are required to expel all consumed seeds, and holding yards will then require treatment to control prickly acacia seedlings following rainfall.

Biological control

Although chemical and mechanical controls are effective, they can be prohibitively expensive where large tracts of land are infested with prickly acacia. Under these circumstances biological control is potentially the most cost-effective method.

Some native insect species that attack native acacias will also attack actively growing prickly acacia. One of these insects – the root eating cicada *Cicadema oldfieldi* – is thought to be one of the causes of the prickly acacia dieback observed occasionally during drought conditions.

A biological control program has been operating since 1980. Of 260 insect

species known to attack prickly acacia, 17 are likely to only feed on prickly acacia and are therefore potentially suitable for introduction to Australia. So far, the Queensland Department of Natural Resources and Mines has released six insect species into prickly

acacia infestations across the state. However, only a few of these species have established and their impacts have not been significant. Further research continues into the suitability and potential for success of other biocontrol species.



Dozer pushing prickly acacia is especially suited to infestations of medium density over large areas.
Photo: Nathan March

Prickly acacia management on Zara Station

Both sheep and cattle are run on Zara Station, south of Hughenden in the Mitchell Grass Downs of north-central Queensland. When Charles and Benda Reddie purchased Zara in 1991, almost half of the station was infested with prickly acacia. The worst infestations along creeks severely hindered mustering and reduced pasture production.

Recognising that it threatened the economic viability of their property, the Reddies made control of prickly acacia a high priority. They have trialed a wide range of methods and invested significant resources in prickly acacia control, with ultimately positive results.

The Reddies prevent the spread of prickly acacia by shifting stock from paddocks with seeding prickly acacia only after six days quarantine in a holding paddock.

The first priority was to control seed-producing prickly acacia and to contain dense infestations. Next, lighter scattered infestations on the open downs country were targeted for control, working back towards the denser infestations. This approach ensured that the effort was expended where it was most effective. Features that are important in the successful running of the station, such as watering points, fencelines and yards, were also targeted from an early stage.

Basal bark spraying of herbicides was conducted in heavily infested areas.

In some cases near creeks, stumps were cut using chainsaws and then immediately treated with herbicide. Overall spraying, whether applied from the ground or air, did not result in effective control of prickly acacia.

In addition to using herbicides, mechanical control was used to remove prickly acacia when supplementary feeding of stock was required, helping to offset the cost of control. However, this is only useful when the prickly acacia is in leaf, which is often not the case during drought. Both pushing the prickly acacia (ideally with a 150 hp or greater dozer) and double-chain pulling (using two 410 hp dozers) are effective, but the latter is more economical.

Follow-up control, in some cases ten years after initial treatment, has been necessary. A pressure sprayer mounted on a two-wheeler or quad bike is used to basal bark spray seedlings and regrowth. Experiments with fire were helpful in clearing out rubbish but did not kill untreated plants.

Although the Reddies have invested much of their own time and money into controlling prickly acacia, neighbouring landholders have also assisted via 'labour barter' days, which are organised by the Upper Landsborough Catchment Landcare Group. Resources and labour are shared under the scheme, which also



Charles Reddie inspecting pasture regrowth following chaining and follow-up herbicide control of prickly acacia.
Photo: Nathan March

allows the sharing and dissemination of weed control knowledge, and provides an opportunity for socialising, peer support and cooperative action against this devastating weed. Other in-kind technical assistance has been provided by the local Land Protection Officer, Department of Natural Resources and Mines.

After nearly 12 years' effort, Zara Station is now almost free of prickly acacia. Future management plans include fencing to control grazing pressure and continued follow-up control of prickly acacia.



Basal bark spraying – Camooweal area, northwestern Qld.
Photo: Nathan March

Legislation

Landholders are required by law to control and, where possible, eradicate prickly acacia in Queensland, Northern Territory, Western Australia, South Australia and parts of New South Wales. Check with your local council or state or territory weed management agency for its status in your region.

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Information and guide revision:
National Prickle Bush Management

Group, including Nathan March (Qld DNRM), Shane Campbell (Qld DNRM/ Weeds CRC), Nora Brandli (Lake Eyre Basin Coordinating Group), Phil Maher (Qld DNRM) and Dennis Kerr. Other assistance from Tony Grice (CSIRO/Weeds CRC), Christopher Love (Dow), Peter Spies (Qld DNRM), Charles Reddie (Zara Station) and John Thorp (National Weeds Management Facilitator).

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



How to control prickly acacia

Quick reference guide

Controlling its spread

Outside the main prickly acacia infestations, control of spread is the highest management priority. Because most new infestations are spread easily by cattle consuming and expelling viable seeds:

- if possible, run sheep in infested paddocks. Sheep do not spread the seed as effectively as cattle, and graze seedlings more heavily
- do not allow cattle to browse on prickly acacia in seed

- quarantine stock for six days before moving into an unaffected area.

Integrating control options

For large infestations integrated control involves a combination of mechanical and chemical methods, fire and grazing management. Some of the costs of mechanical control can be offset by the provision of drought-time fodder. Strategically target either the least infested areas or major sources of seeds for initial control, then work towards denser infestations.

Strategically target priority infestations

Limit prickly acacia's spread and impact on property management by clearing mustering lanes, fencing off dense infestations from clear areas and clearing around watering points.

Follow-up

Germination following control can be prolific and some seed can remain viable in the soil for 15 years. Ongoing follow-up investigation and treatment are therefore required.

How to identify the prickly bushes

Prickly acacia is one of four prickly 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 characters of each prickly bush. Prickly acacia can be distinguished by its fern-like leaves, ball-shaped golden flowers and grey-green haired seed pods which have distinctive constrictions between the seeds. The following table summarises the fact sheet.

Feature	*Mesquite <i>Prosopis</i> spp.	Mimosa bush <i>Acacia farnesiana</i>	*Parkinsonia <i>Parkinsonia aculeata</i>	Prickly acacia <i>Acacia nilotica</i>
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 'lamb's 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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