Department of Science, Information Technology and Innovation

Reducing weed risks from fodder

Queensland Herbarium

Australian Government | National Landcare Programme

Weed Spotters Network Queensland

AGFORCE

Queensland Government

Prepared by

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Cover Photo: Round hay bales at dawn; photo by Henry Firus

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Contents

Introduction

Across Queensland's grazing lands, rainfall tends to be highly variable leading to periods of low pasture productivity. During dry seasons and in times of drought, fodder is an important tool used widely to manage grazing properties. Not only does fodder provide nutrition for cattle when pasture productivity is low, the dietary fibre it provides is vital to maintaining healthy rumen function in cattle when the protein content of pasture is reduced. Fodder can be grown and sourced locally either from your property, neighbouring properties or local suppliers. Fodder may also need to be sourced from further afield, including interstate, particularly during wide spread drought events.

In cases where fodder of unknown quality is imported from outside of your region, it may contain seeds from fodder and weed species that are not currently known or that don't currently pose a problem in your region. These new and emerging weeds can compete with pasture for water and nutrients, leading to reduced pasture productivity, reduced stocking capacities and erosion. Increased control and management costs are likely, arising from the need for physical, mechanical and chemical control methods. Fodder contaminated with dried stalks, leaves or seeds of toxic weeds can pose a threat to livestock. Where the source and quality of the fodder can't be identified, taking steps to reduce weed risks is recommended.

This guide to *Reducing weed risks from fodder* aims to increase awareness of weed risks associated with fodder use in Queensland. It highlights tools which can be used to help you assess your weed risks when sourcing fodder and suggests simple strategies for reducing weed risk during fodder transportation, storage and feeding out. Ongoing monitoring for new weeds following the use of fodder is also recommended and this guide explains easy steps to monitor your weeds and have them identified. An information guide to weeds commonly associated with fodder movement is also included.

This guide to *Reducing weed risks from fodder* has been funded by the Australian Government National Landcare Programme.

P. Robins

Managing your fodder weed risks

What is fodder?

Fodder is any dried feed provided to livestock as a supplement or a diet replacement. It is particularly relied upon in times of drought and dry seasons when pasture cover and/or nutrition is low. In this weed guide, fodder includes

- hay (cut and dried pasture grasses, including mulch hay)
- silage (fermented, high-moisture fodder sealed in plastic or pits)
- forage sorghum or stubble from other cereals
- lucerne/legumes
- grain, cotton seed or protein meal.

Weed hygiene declarations

- With the introduction of the *Biosecurity Act 2014* on 1 July 2016, Weed Hygiene Declarations are no longer in use
- Instead, all individuals must meet their General Biosecurity Obligation (GBO) not to spread seeds of any weed species
- Fodder contaminated with declared plants cannot be sold (restricted category 3) and in some cases, may not be sold, moved or given away (restricted category 2,3,4,5)
- Individuals or industry may develop their own format / template for a Weed Hygiene Declaration, these are under development

When importing fodder onto your property, you can make an informed choice by asking your supplier:

- Is a fodder vendor declaration available? (for an example, see http://afia.org.au/index.php/2013-04-22-05-37-59/2013-04-18-03-38-45/vendor-declaration-form). If not, ask
- What plant species, including weeds, are known to be in the fodder?
- Is the fodder free from weed seeds and dried stalks of toxic weeds?
- Where was the fodder grown or sourced from?
- What are the major weed species known to occur in the fodder production area?
  If your supplier is unsure, you can investigate this yourself.

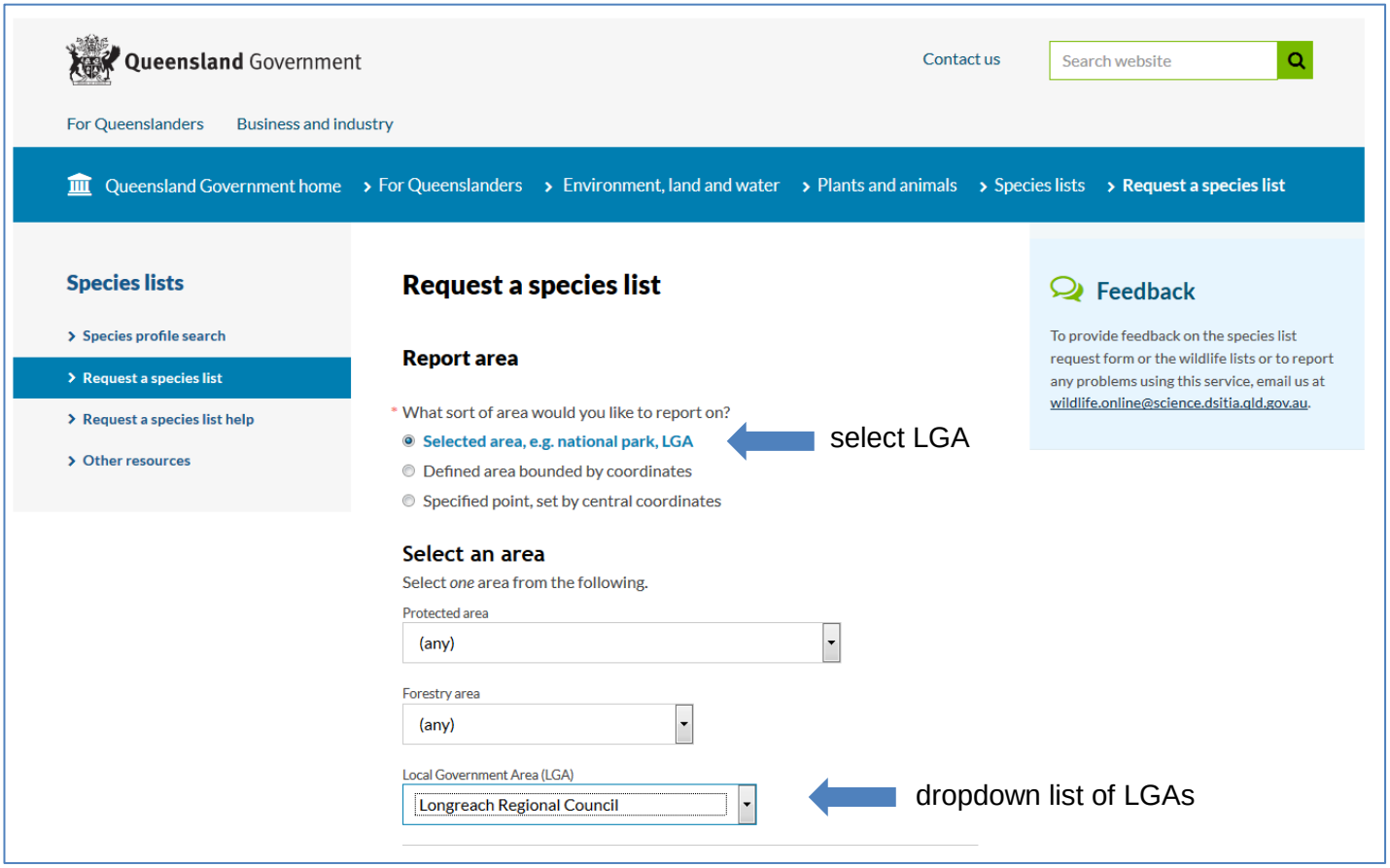
What are the major weed species known to occur in the fodder production area?

You can request a list of weed species known to grow in the fodder production area across Queensland to be emailed to you from the Queensland Government. Simply follow the six steps below to help inform your decision about importing fodder.

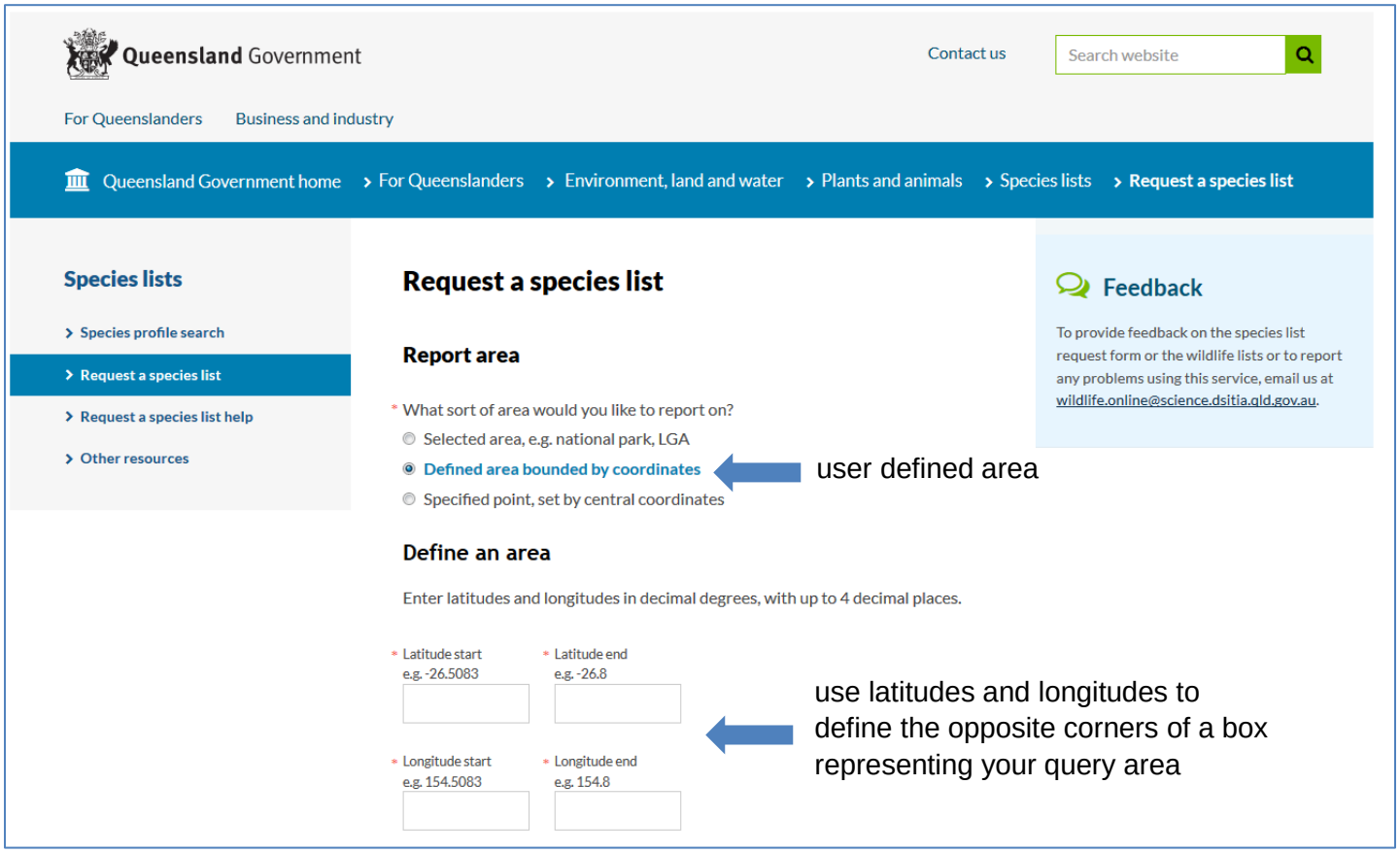
Step 1 Go to the website https://environment.ehp.qld.gov.au/report-request/species-list/

Step 2 Select the fodder production area you would like a weed list returned for. You can either:

- Option 1 - select a predefined area. Local government area (LGA) will be most relevant for fodder production, or

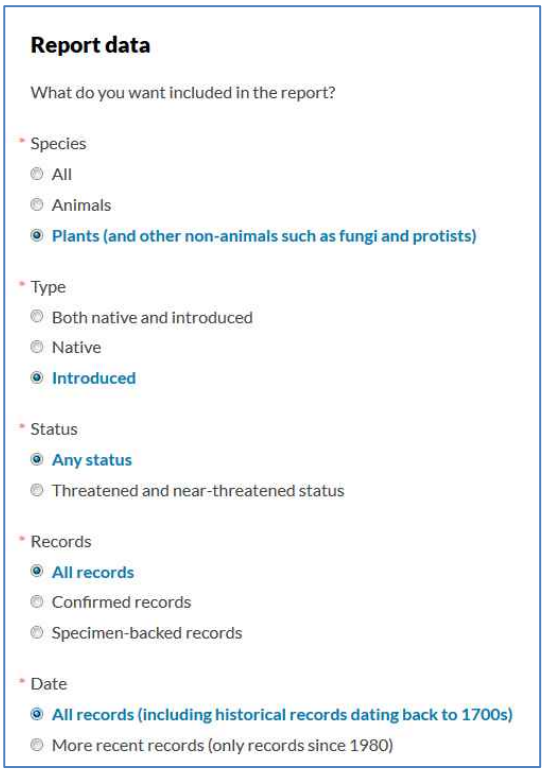


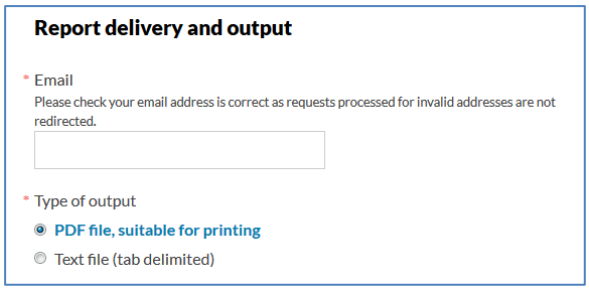
- Option 2 - request data for a user defined point or area (see below). The latitude and longitude for a single point or for the corners of a box you wish to query can be found using Google Earth (downloadable from https://www.google.com/earth/).
- Convert locations recorded as eastings and northings to latitude and longitude using an online tool such as the one provided by Geoscience Australia: http://www.ga.gov.au/geodesy/datums/redfearn_grid_to_geo.jsp



Step 3 Select the data required. For weeds that could potentially be in fodder purchased in that area, select:

- Plants
- **Introduced**
- Any status
- All records





Step 4 Enter an email address where you'd like the data sent.

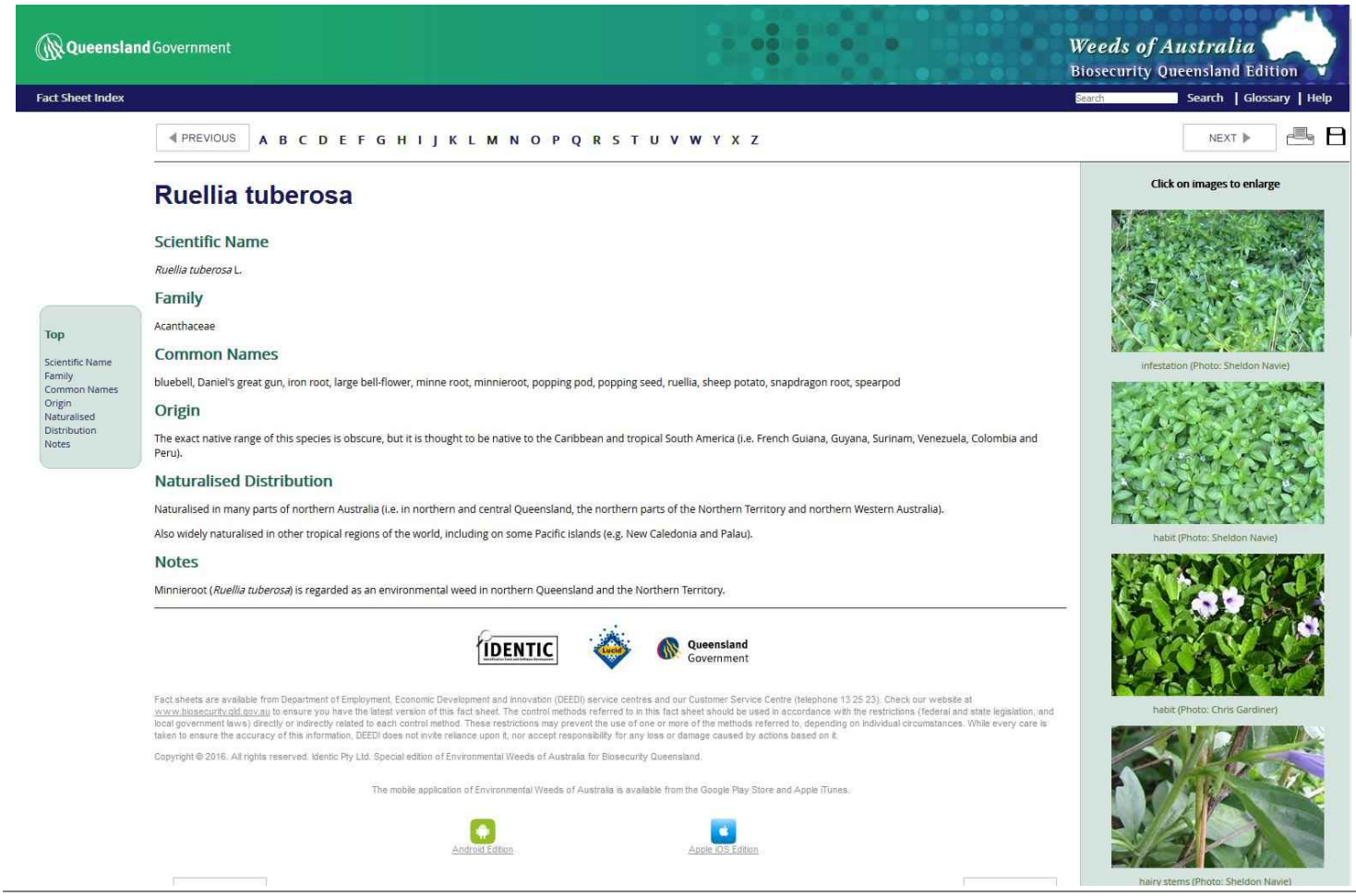
Step 5 Select the type of data you would like to receive:

- a pdf file for reading or printing, or
- a text file for opening in a spreadsheet

Step 6 Once your data is emailed to you (example below), check the list of weeds for any declared or highly invasive species.

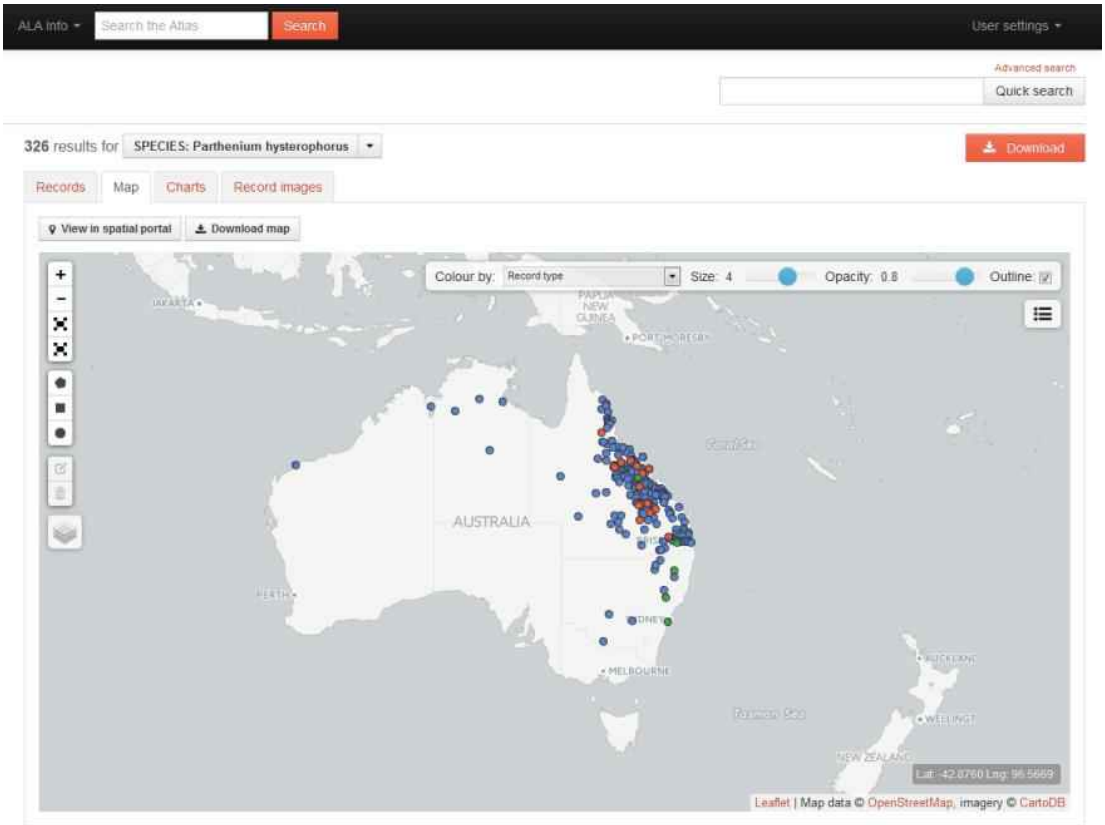
Kingdom	Class	Family	Scientific Name	Common Name
plants	higher dicots	Acanthaceae	*Ruellia tuberosa*	
plants	higher dicots	Aizoaceae	*Trianthema portulacastrum*	black pigweed
plants	higher dicots	Amaranthaceae	*Amaranthus viridis*	green amaranth
plants	higher dicots	Amaranthaceae	*Alternanthera pungens*	khaki weed
plants	higher dicots	Amaranthaceae	*Gomphrena celosioides*	gomphrena weed
plants	higher dicots	Amaranthaceae	*Aerva javanica*	
plants	higher dicots	Apocynaceae	*Calotropis procera*	
plants	higher dicots	Apocynaceae	*Cryptostegia grandiflora*	rubber vine
plants	higher dicots	Asteraceae	*Xanthium occidentale*	
plants	higher dicots	Asteraceae	*Acanthospermum hispidum*	star burr
plants	higher dicots	Asteraceae	*Bidens bipinnata*	bipinnate beggar's ticks
plants	higher dicots	Asteraceae	*Gnaphalium polycaulon*	
plants	higher dicots	Asteraceae	*Eclipta prostrata*	white eclipta

You can search for information about weed species and management on your list via the Weeds of Australia Biosecurity Queensland edition website found at: https://keyserver.lucidcentral.org/weeds/data/media/Html/index.htm (example below)



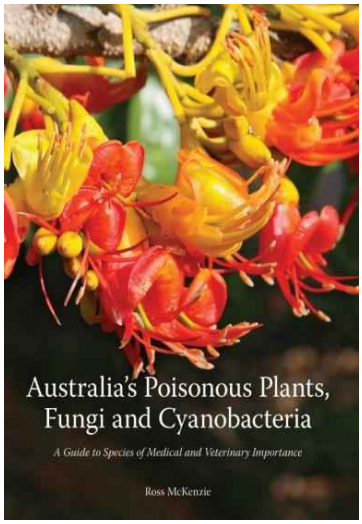
If you are concerned about the risk of importing a particular species from outside of your region or outside of Queensland, you can search for its distribution via the Atlas of Living Australia https://www.ala.org.au/

Simply search on a species name to return a map of known locations (see below).



Weigh up the risks of importing any new or potentially harmful weeds onto your property or into your region. It is possible that your fodder may not contain any of these weed species. Not all weeds will pose a significant risk, however toxic and invasive species should be avoided. Also consider that not all weed species may be included in this list, as some may have avoided detection or collection in the fodder production area.

Some information on the toxic properties of fodder weeds is contained in this weed guide but for detailed information we recommend you consult the publication: McKenzie, R. (2012) *Australia's poisonous plants, fungi and cyanobacteria: A guide to species of medical and veterinary importance*, CSIRO publishing, Collingwood. (RRP $195 from CSIRO Publishing http://www.publish.csiro.au/book/6507/)



Transporting fodder

Fodder often has to be transported large distances by trucks or smaller vehicles, making transportation an important potential source of weed seed spread. Simple steps to reduce weed spread risks include:

- Maintain records of when fodder was purchased and from where
- Secure or cover loads of fodder to avoid the spread of weed seeds and fragments in transit
- After delivery, ensure vehicles and machinery are cleaned down in a location that can be easily monitored for weed germination
- Check your vehicle clean-down site after any rain for weed germination and destroy weed seedlings as they emerge
- Monitor road sides and farm tracks for weeds following a delivery, particularly following rain.

J. Clarkson

Storing fodder

Fodder may often need to be stored for extended periods of time. It is important to prevent fodder being moved accidentally via wind, water or livestock, as even very old fodder may still contain viable weed seeds.

- Store fodder away from livestock and busy vehicle tracks or roads to reduce accidental weed spread
- Monitor around storage areas regularly, particularly following rain, and treat any weeds before they become established

Feeding out fodder

Weed seed can be spread by livestock both directly, when seeds become attached to their hooves and body, and indirectly via livestock manure. Restricting the dispersal of weed seed via livestock can limit the scale of new weed incursions.

- Choose flat, arable areas with easy access for feeding out fodder as this encourages weed germination in situ. It also increases options for control should weeds germinate to include mechanical, chemical, biological control and/or management by grazing

- Feed out fodder in restricted areas or paddocks quarantined from the rest of your property which can be regularly monitored for weed germination
- By restricting livestock movements to accessible paddocks after feeding out, all weed seed that passes through their digestive system can be controlled if germination occurs. This prevents seeds being transported away from the quarantined area and spread across your property.

Monitoring for weeds

Early detection and eradication is the simplest and most cost effective means of dealing with new weed incursions. By regularly checking for weeds, you can reduce their impacts and control costs.

- Regularly monitor quarantine/feeding out areas for weed germination, particularly following rain
- Monitor around watering points, quarantine areas and holding yards
- Once feeding out of fodder is complete, clean the area of any waste fodder. Depending on the season and any hazards, burning the feeding out site may be possible. A cool fire will reduce viability of seed on the soil surface. Continue to monitor the site for several years for weed germination.
- If you find any new weed species, photograph or collect them and have them identified without delay
- Once identified, assess each weed species for risks of invasiveness or toxicity
- Treat any problem weeds before they can become established and set seed

How to collect, preserve and send weed specimens for identification

Some plants may be able to be identified from fresh material taken to your local weed expert, while others may be identifiable from photographs. Photos can be sent to the Queensland Herbarium (Queensland.Herbarium@qld.gov.au) or Biosecurity Queensland (https://www.daf.qld.gov.au/plants/weeds-pest-animals-ants/weeds/preventing-weed-spread/identify-pest-plants) for identification. In some cases, for a plant to be correctly identified, a pressed specimen will be required. Specimens are simply plants that have been dried flat between sheets of newspaper under a weight, preserving their features and allowing them to be sent to the Queensland Herbarium for identification. The Queensland Herbarium houses more than 850,000 pressed specimens which are used for botanical and ecological research, mapping and tracking the distribution of plants across the state, including weeds.

A Herbarium specimen of Hygrophila (*Hygrophila costata).* This species is a Restricted Invasive Plant (Category 3) under the *Biosecurity Act 2014*.

Collecting plant specimens is simple, but a few things need to be kept in mind. Make sure you have permission to access private land before entry. Collecting within a National Park or State Forest is illegal without appropriate permits. Appropriate protective equipment should be considered such as sunscreen, sun safe clothing and a hat, sturdy shoes, water, food and a first aid kit. Although specialised equipment is not required, a few basic items will improve the quality of your specimen:

- Secateurs for cutting up specimens
- Newspapers
- Sheets of corrugated cardboard (eg. sections of a cardboard box)
- Notebook or copies of the Queensland Herbarium's specimen cover sheet (Appendix A)
- GPS, map or access to Google Earth
- Camera
- Gloves for collecting plants with sap or prickles

Considerations when collecting weeds

- Prohibited and some Restricted invasive plants are not allowed to be moved, however, an exemption under the Biosecurity Act 2014 allows for the collection of weed specimens for the purpose of identification by the Queensland Herbarium. All specimens, whether declared or not, can become sources of weed spread so weed hygiene should be practiced at all stages.
- When collecting weeds, care must be taken to ensure seeds and plant fragments are not accidently spread. Ensure that no seeds or fragments are transported on your clothes, shoes, equipment or vehicles. Contaminated vehicles should be cleaned according to the vehicle clean-down procedures provided by the Department of Agriculture and Fisheries https://www.daf.qld.gov.au/plants/weeds-pest-animals-ants/weeds/preventing-weed-spread/cleandown
- Seed heads can be separated from your specimen and placed in sealed envelopes to contain them. Alternatively, the entire specimen can be placed in a paper bag or envelope. Ensure seeds can't fall out of your pressed plant during transportation or postage.

How to collect and press plant specimens

Step 1 Find a specimen typical of the species you would like to have identified, preferably with stems, leaves, flowers and/or fruits attached. Record the longitude and latitude of your specimen by using a GPS, by finding your location on a map or checking your location via Google Earth.

Step 2 Use secateurs to cut a section of the plant 25–40 cm long and up to 26 cm wide (just smaller than A3 paper size). If your specimen is very large, simply cut it into sections before pressing. For grasses, roots and seed heads are needed to aid identification, so make sure you pull up the whole plant from the roots.

Step 3 Place your specimen onto newspaper with care regarding how the final specimen will appear. Ensure limited overlapping of material to prevent mould from growing on your specimen. Long plants such as grasses can be folded multiple times to fit into your newspaper.

Step 4 Sandwich the newspaper between sheets of corrugated cardboard then flatten the specimen by placing a flat weight on top of the cardboard such a heavy book.

Step 5 Download and fill in a specimen cover sheet (https://www.qld.gov.au/environment/plants-animals/plants/herbarium/identify-specimens; Appendix A) with your contact details, details about your specimen and the collection date. Include as much information about your site and specimen as requested on the specimen cover sheet. Information about your location, dominant vegetation type, soils and geology, flower colour and plant height will assist botanists to identify your specimen.

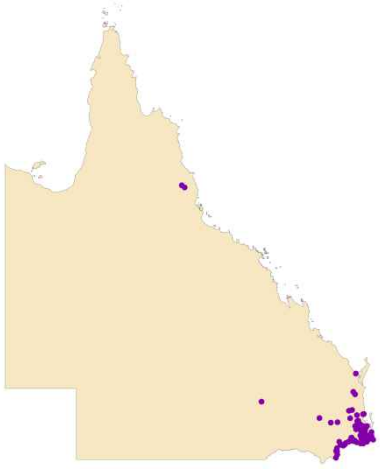
And finally,

Step 6 Dry your specimen for at least one week, changing the newspapers daily to prevent mould growth. Once dry, place your specimen, supported by a sheet of cardboard, along with your specimen cover sheet into an envelope and send it to:

Advisory Services
Queensland Herbarium
Brisbane Botanic Gardens
Mt Coot-tha Rd
TOOWONG Qld 4066

You should receive a reply from the Queensland Herbarium in approximately two weeks.

Common fodder weeds in Queensland



fireweed (*Senecio madagascariensis*)

Restricted (Category 3)/WONS, toxic

Family: Asteraceae


Fig 1 DAF

Origins

Fireweed is an erect annual or short-lived perennial herb native to Southern Africa and Madagascar. It was first recorded in Australia in the Hunter Valley, New South Wales in 1918. This member of the daisy family is believed to have been introduced in ship ballast water from Capetown, Africa, but was likely also introduced separately as a garden ornamental. Fireweed is common on grazing land and is now a serious pest plant in South East Queensland. Ideal sites for infestations include disturbed habitats such as open pastures and woodlands, grasslands, suburban bushland, roadsides, contour banks, waste areas and parks.


Fig 2 B. Phillips

Known invasion pathways

Fireweed is a highly invasive opportunistic coloniser. It commonly establishes where there is poor pasture or limited ground cover, often the result of overgrazing, drought, fire or slashing. Wind can disperse the seed up to 1 km away from the original infestation. Fireweed can also be found as a contaminant of fodder, hay, mulch, soil and turf and can be spread by livestock, native and feral animals, farm machinery, and vehicles, as well as on clothing.

Description

Fireweed is able to grow on most soil types from high to low fertility, acid, sandy soils and self-mulching clays, but thrives on well-drained light textured soils and acid soils of low to medium fertility. Fireweed does not tolerate shaded situations, areas that are waterlogged or have poor drainage. It has a taproot that is shallowly branched with many fibrous roots and in situations where the plant has blown or fallen over, it can sprout roots where the stem touches the ground.

Fireweed can be very difficult to identify as it is highly variable in growth form and can easily be confused with a number of other *Senecio* species, including many native species. The flowers are

the best and most reliable identification feature. Under ideal growing conditions, fireweed can grow as a branching herb to 50 cm tall with long wide leaves (6 cm x 2 cm) and up to 100 flowers per plant (fig. 1). During drought, however, it may only reach about 20 cm in height, be unbranched with narrower leaves that are almost always undivided or sometimes lobed, and have few flowers.

The daisy-like flowers are 2 cm in diameter (fig. 2) with conspicuous yellow rays that resemble petals. Distinctively, it has 18–22 green leaf-like overlapping bracts underneath the flower (fig. 3). Seeds (achenes) are cylindrical in shape, covered with minute hairs, 1.5–2 mm long and 0.3–0.5 mm wide, with a tuft or parachute of long silky hairs (pappus) at one end (fig. 4). Upper leaves are generally 2–6 cm long, alternate along the stem, dark green in colour with a serrated margin (fig. 5). The lower leaves are lobed (fig. 5). Fireweed can produce seed continuously over its growing season with each plant capable of producing up to 10,000 seeds per plant. Seeds can germinate quickly between March and June, and die back in spring. Heavy infestations can occur when autumn or winter rains follow a dry summer.

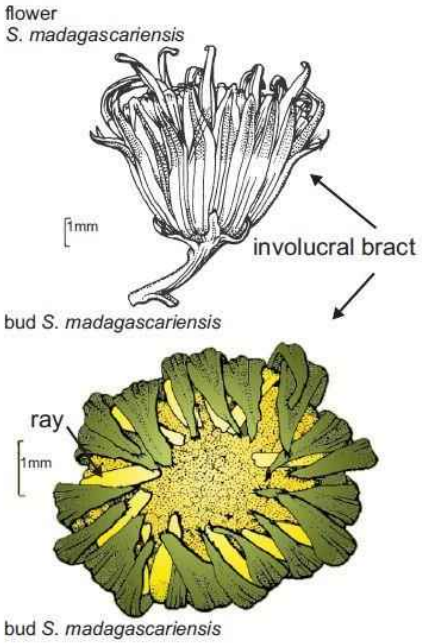


Figure 3 W. Smith

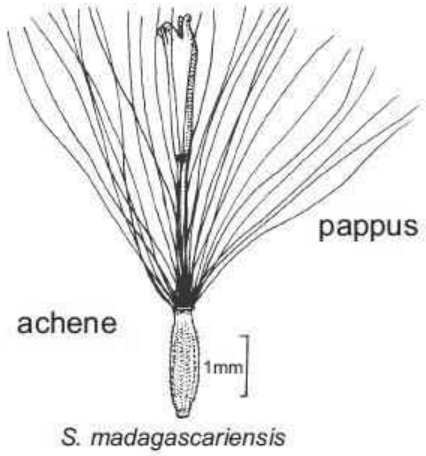


Figure 4 W. Smith

Impacts

Fireweed can spread and dominate viable grazing land, competing with and excluding palatable grazing species and disrupting native habitats. It is a prolific seed producer which combined with its widespread dispersal by wind, allows it to out compete pasture species in areas that have been heavily grazed or neglected. It is a resilient and persistent weed and infestations can greatly reduce the grazing capacity of a property by decreasing pasture production while also increasing management costs. Light infestations can produce up to 1 million seeds per hectare and these can remain viable in the soil for several years, germinating when favourable conditions occur.

Toxicity

Fireweed contains pyrrolizidine alkaloids. All above ground parts of the fireweed plant are poisonous to grazing animals, especially horses and cattle, causing illness, slow growth and poor condition, often resulting in death of the animal. Fireweed remains toxic to stock even if dried and found as a contaminant of fodder.

A native species of very similar appearance, *Senecio brigalowensis*, is also toxic to stock and is difficult to distinguish from introduced fireweed. In general, the leaves of this native species are shallowly lobed to less than one half of the leaf width, whereas fireweed leaves deeply lobed to more than half the leaf width (fig. 5).

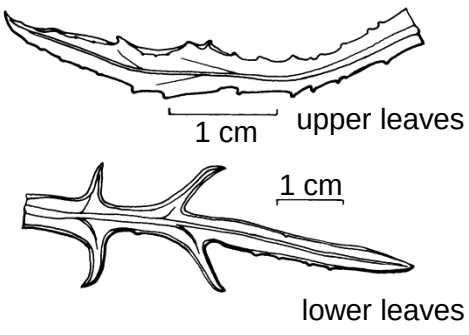
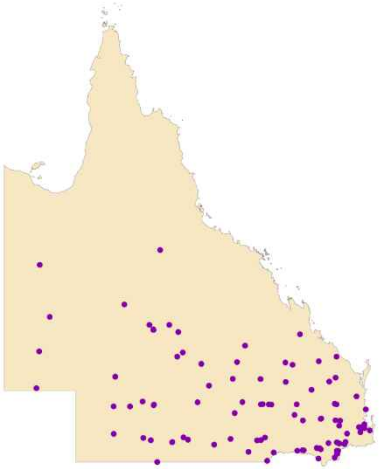


Figure 5 W. Smith



marshmallow (*Malva parviflora*)

Not declared, toxic

Family: Malvaceae

Origins

Marshmallow is a widely naturalised annual herb native to the Mediterranean, northern Africa, the Arabian Peninsula, western Asia, south eastern and south western Europe. It is the most common and widespread species of *Malva*. Marshmallow is a weed of disturbed areas, found in and around stock yards and farm buildings, along water-courses, roadsides, gardens, amongst pastures and crops. Changes in farming practices, such as minimum tillage, has helped further spread this weed resulting in an increased distribution across Australia over the last decade. Marshmallow has the potential to become a significant weed in Australia.

Fig 1 R. Brown

Known invasion pathways

Marshmallow is spread by seed which can be moved through waterways, often resulting in infestations on alluvial flats (fig.1). Seed is also spread as a contaminant of fodder or as a result of ingestion by sheep, horses or cattle. The seed is excreted where soil disturbance and fertility from manure are increased, particularly in and around stock yards and along stock routes.

Fig 2 S. Navie

Description

Marshmallow can be found growing on most soil types. It is an erect, sprawling or decumbent annual or biennial herb to 50 cm tall (fig. 2). The plant is covered in stiff star-shaped hairs and is woody towards the base. The stems are fibrous, branched and somewhat purplish in colour. Alternately arranged leaves are a dull dark green colour, 1.5–12 cm long. They are roughly circular in shape with toothed margins and a heart-shaped leaf base (fig.3).


Fig 3 S. Navie

Marshmallow thrives after autumn and winter rains, flowering from March through to November. The flowers have 5 petals with numerous stamens fused into a central column similar to a hibiscus (fig. 4). The petals are white, blue/purple or pink in colour. They are 5–6 mm in diameter and are found in clusters of 2–5 where the leaf meets the stem. Green disc-shaped fruit are 7–8 mm in diameter (fig. 5a), maturing to brown (fig. 5b) and split into 8–12 wedge-shaped segments, each containing a small red-brown kidney shaped seed. The seeds are able to survive for long periods in the soil.

Impacts

As with most invasive weeds, marshmallow competes for nutrients, light and water to the detriment of native ecosystems and agricultural crops. Marshmallow has been responsible for crop yield losses of up to 30% in Canada. Marshmallow is difficult to control as it has a substantial tap root enabling it to survive long periods of drought and a degree of resistance to glyphosate. The plant has a fast growth rate, a long flowering period and high seed viability. It is capable of flowering and setting seed within two months of germination.


Fig 4 S. Navie

Toxicity

Marshmallow stems and leaves contain nitrate and can cause staggers in stock including ruminants, horses and sheep. The leaves and seeds contain malvalic acid, which if eaten by poultry, can give rise to egg whites being tinged pink and the yolks becoming pasty. Even dried marshmallow contained in fodder can poison stock.

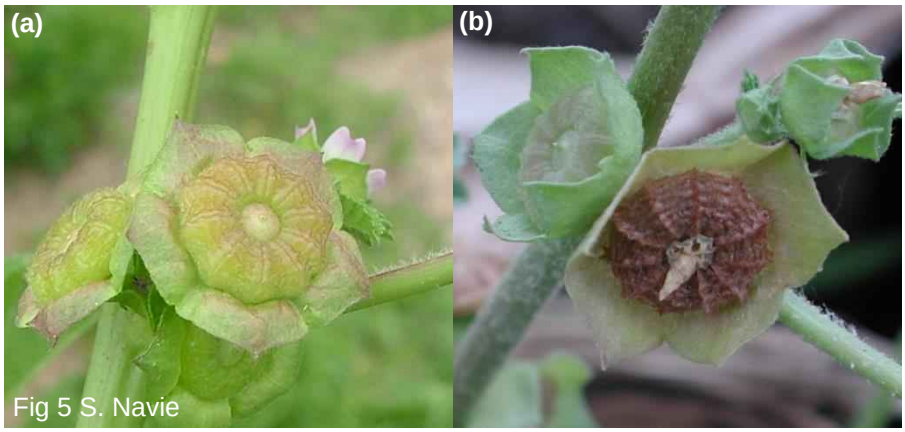
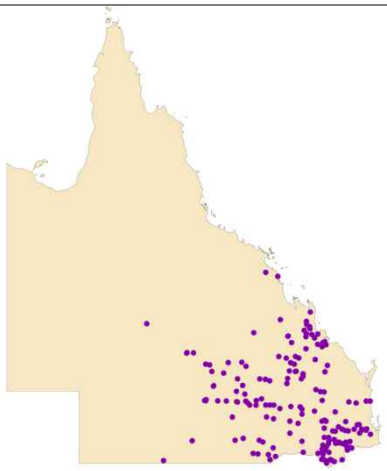


Fig 5 S. Navie



Mayne's pest (*Glandularia aristigera*)

Not declared, toxic

Family: Verbenaceae


Fig 1 M. Vitelli

Origins

Mayne's pest is a perennial herb native to South America. Initially introduced into Australia as a garden ornamental, it is now regarded as an invasive weed in Queensland, the Northern Territory, Victoria and New South Wales. Mayne's pest is also common in coastal, sub-coastal and inland areas of southern and central Queensland.

Known invasion pathways

Mayne's pest can become established along roadsides, railway lines and in other disturbed areas. It is a common weed of pastures and crops.
Mayne's pest also invades open woodlands and grasslands, out-competing native plant species.


Figure 2 S. Navie

Description

Mayne's pest is a sprawling to prostrate perennial herb, growing to 50 cm tall (fig.1). The plant is aromatic and moderately hairy, with stems that are square in cross-section. The leaves are roughly triangular in outline, 2–7 cm long and 0.5–3 cm wide. They are deeply dissected (fig. 2), dark green, and hairy on both sides.

Mayne's pest flowers from spring through to summer. The flowers have petals that are distinctively two-lipped (fig. 3). Flower colour ranges from dark purple through to blue and mauve and very occasionally, white (fig. 4). All have a pale to white centre. The flowers are clustered at the ends of the branches. The fruit separates into 4 segments (mericarps) each 3–3.5 mm long.


Fig 3 S. Navie

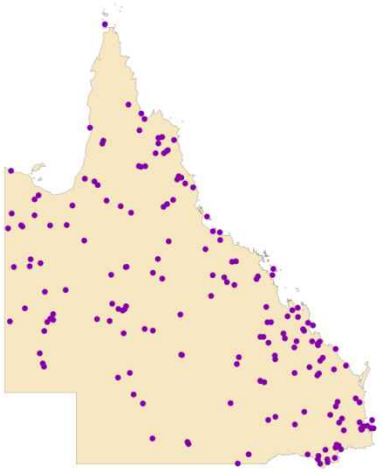
Impacts

Mayne's pest is a highly invasive plant that can spread very quickly after its initial establishment. It competes with native species in grasslands and is a common weed of riparian zones. Infestations could come to dominate native areas, ultimately threatening ecosystems and reducing biodiversity.


Fig 4 S. Navie

Toxicity

Unidentified toxins in Mayne's pest have been linked to photosensitisation in sheep, poisoning of poultry and behavioural changes in horses.



Noogoora burr (*Xanthium occidentale*)

Not declared, toxic

Family: Asteraceae


Fig 1 DAF

Origins

Noogoora Burr is a robust woody annual native to North and Central America, Mexico and the Caribbean. The first sighting in Australia was on Queensland's Noogoora Station in the 1870s, where it is thought to have been accidentally introduced as a contaminant of imported cotton seed. The plant is now firmly established and widespread across Queensland. Noogoora Burr is one of most the serious and widespread weeds in the world. It thrives in areas where there is high rainfall, but can persist in more arid regions. It is thought that the total area of infestation in Australia may exceed two million hectares.

Known invasion pathways

The main invasion pathway for Noogoora burr is through water movement. The plant is a prolific producer of seeds, allowing it to establish and dominate the banks of streams, drainage lines and channels, particularly after flood events or irrigation. Infestations can also occur along roadsides and on other disturbed sites (fig. 1). Its hooked seeds (fig. 5) can be spread via fodder, be transported on animal fur, clothing (socks, boots of workers) or on vehicles (farm machinery, roadworks machinery/vehicles). The seed of Noogoora burr can remain viable in the soil for up to ten years, germinating only when conditions are favourable.


Fig 2 S. Navie

Description

Noogoora burr thrives on rich soils including black soil and alluvium, but can be found growing on a wide variety of soil types. Seeds generally germinate from December through to March, with seed produced from February to April. Under favourable conditions, however, it is capable of germinating and seeding at any time throughout the year.

Mature Noogoora burr usually grows to 2 m tall, but can reach up to 3 m under ideal conditions. The stems are green and/or purple (fig. 2) and are covered with stiff

hairs. The leaves are rough to touch, dull dark green in colour and are similar in shape to a grapevine leaf with 3–5 irregularly toothed lobes (fig. 3). The leaves are 5–15 cm long and up to 15 cm wide. They have prominent purplish veins and a stiff stem up to 15 cm long.


Fig 3 S. Navie

Flowering occurs during summer and through to autumn. The flowers are small, inconspicuous and pale green in colour with both male and female flowers appearing at the same time (figs. 2 & 4). Male flowers are found in the forks of upper leaves only, are globular in shape with a short stalk. The female flowers, which later develop into burrs, occur all over the plant, generally in clusters in the forks of leaves or at the ends of small branches.


Fig 4 DAF

The fruit or burrs of Noogoora burr are oval (2–2.5 cm long and 0.5–0.8 cm wide), green or brown and are covered with hard, woody hooked spines with two rigid spines at one end (figs. 4 & 5). Each burr contains two seeds that are grey or black in colour, 4–5 mm long and 5–7 mm wide and flattened along one side. The burrs are grouped in clusters on the plant.


Fig 5 S. Navie

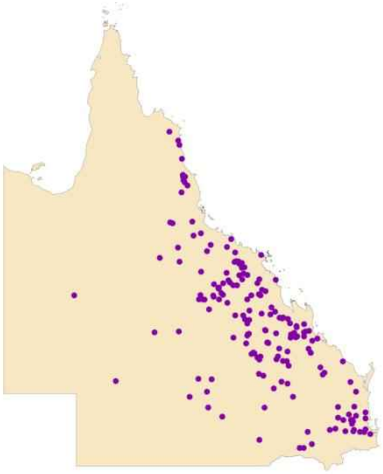
Impacts

Dense thickets of Noogoora burr along the banks of watercourses can form a physical barrier, preventing stock from gaining access to drinking water. The burrs can lodge in the hooves of stock causing irritation, infection and lameness. Burrs are also a contaminant of wool, posing a risk to shearers as well as increasing wool processing costs. Noogoora burr can out-compete pasture crops for moisture, nutrients and sunlight, reducing yield. It is a major weed of irrigated soya beans, maize, sunflower and cotton. It can also out-compete native flora such as cane grass along watercourses, threatening nesting sites for species such as purple-crowned fairy-wrens.

Toxicity

The leaves of Noogoora burr seedlings (fig. 6) are a different shape to the mature leaves and are toxic to stock if eaten. The toxins contained in these young leaves and the burrs can cause liver damage in stock. Noogoora burr can also cause dermatitis in humans and farm animals, while the pollen may cause hay fever.


Fig 6 S. Navie



Parthenium (*Parthenium hysterophorus*)

Restricted (Category 3)/WONS, toxic

Family: Asteraceae

Origins

Parthenium is a robust annual herb native to the subtropics of North and South America, but is now a widespread weed found around the world. Parthenium was first recorded in Australia near Esk in Queensland in the 1950s, where seed is believed to have arrived as a contaminant on American aircraft landing at a local airstrip. A second incursion, again in Queensland, was found near Clermont (Central Highlands) in 1964 and may have arrived as a contaminant of imported pasture grass seed.


Fig 1 DAF


Fig 2 DAF

Known invasion pathways

Parthenium produces vast quantities seed, up to 100,000 per plant. The seeds can be transported as a contaminant on stock, through contaminated fodder or pasture seed, via water along watercourses, through the movement of farm machinery (harvesters, slashers, earthmovers, backhoes) and other vehicles.

Parthenium thrives in areas with poor groundcover, on exposed soils or on overgrazed pastures (Fig. 1). These conditions are often exacerbated during times of drought. Parthenium is not generally found where there is undisturbed vegetation or good pasture cover. With its extensive seed production and fast germination rate, Parthenium can quickly and aggressively colonise to dominate areas.

Description

Parthenium can be found in semi-arid, sub-tropical, tropical and warmer temperate regions and can grow across a range of habitats including along watercourses, roadsides, railways, amongst pastures, on seasonal floodplains, in grasslands, open woodlands and on waste/disturbed areas. It thrives on alkaline, clay-loam to heavy black clay soils but can tolerate a range of soil types if

conditions are favourable. The colour of the mature plant can vary between bright green and dull blue-grey, depending on the soil and season.

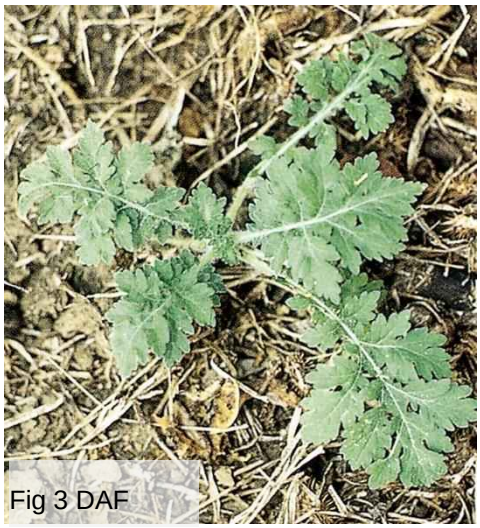


Fig 3 DAF

Parthenium is an annual erect herb growing up to 1.5 m or occasionally to 2 m tall (Fig. 2) with a deep tap root that can become woody with age. The plant begins life as a basal rosette of leaves that are deeply divided and covered in soft, fine hairs (Fig.3). These leaves are pale green and can grow up to 30 cm long. As the plant matures, it becomes much branched (Fig. 2). With age, the leaves become elongated, smaller and finer, looking quite different from the initial juvenile ones. Parthenium grows quickly and can flower when only 3–4 weeks old.

Parthenium flowers are small, creamy white in colour, 4–10 mm across and star-shaped with five distinct corners (Fig. 4). They resemble a diamond in a ring setting. The flowers are held at the tips of the stems which arise from the leaf axils (forks). Parthenium seeds are black, wedge-shaped, 2 mm long and have two thin white to grey scales on them (fig.5). Each flower can produce four to five seeds, allowing each plant to produce huge volumes of seed. Parthenium seed usually germinates during spring/summer, with plants dying off around late autumn. Given good conditions, however, Parthenium can germinate at any time of year.

Impacts

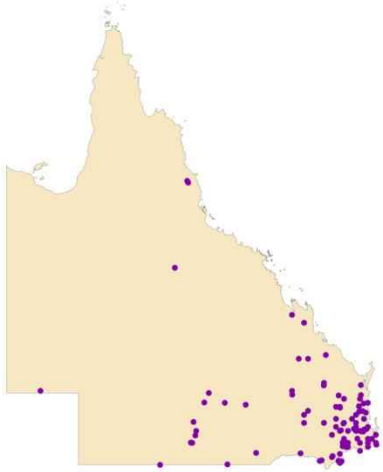
Parthenium can cost the cattle and grain farming industries millions of dollars in reduced production and increased management costs. Parthenium releases chemicals into the soil that actively inhibit the germination and growth of pasture grasses and other native grasses and plants, as well as actively competing for nutrients, water and space. The invasive nature of Parthenium can also cause major changes in the biodiversity of an ecosystem that it has colonised.


Fig 4 DAF

Fig 5 W. Smith

Toxicity

Parthenium is known to be toxic to stock and can cause tainting in meat, most often during times of drought. Parthenium also presents a significant health risk for humans as contact with the plant can cause severe skin irritation (dermatitis, eczema, skin blistering). Parthenium pollen can also cause hay fever and asthma.



Paterson’s curse (*Echium plantagineum*)

Not declared, toxic

Family: Boraginaceae

Origins

Paterson’s curse is native to western Europe, the Mediterranean and northern Africa. The plant was first introduced in New South Wales as an ornamental plant via mail order seed catalogues in the 1840s. The movement of stock along stock routes helped it to spread rapidly and by 1890, Paterson’s curse had become a major weed. Contaminated fodder was a source of further spread, resulting in impacts to agricultural land as well as encroachment into native grasslands, heathlands and woodlands. Paterson’s curse is now recorded in all Australian states and territories.

Fig 1 S. Navie

Known invasion pathways

Paterson’s curse tends not to establish in areas where native vegetation is healthy and undisturbed, or where there is good pasture coverage. It is often found associated with cultivated crops, disturbed or bare ground and as such, is a common weed of roadsides, agricultural land and degraded pastures. It is highly competitive and drought resistant and thrives in regions with high winter rainfall.

Fig 2 S. Navie

Paterson’s curse is commonly spread as a contaminant in fodder and as such, its spread is particularly an issue during times of drought. Paterson’s curse seeds can attach to the wool or fur of livestock and can be spread via manure. Birds and ants, water and soil movement, farm machinery and vehicles can also all spread Paterson’s curse.

Description

Paterson’s curse is a common winter annual. It thrives on sandy soils, but can tolerate a wide range of soil types when conditions are good. It has a stout tap root and many lateral roots. Paterson’s curse grows to a height of 30–60 cm (fig. 1), but can reach 2 m. Juvenile plants have a basal rosette of leaves (fig. 2) that are oval to elongated oval in shape, 10–35 cm long with prominent lateral veins and short leaf stems. These basal leaves will die off as plant stem grows.

The whole plant is covered in stiff bristly hairs. It produces multiple stems that arise from the base and branch towards the top of the plant. The stem leaves are much narrower and smaller than the basal ones (fig. 3), alternate along the stem and are covered in soft or bristly hairs. These mature leaves are oblong and have a heart-shaped base and no leaf stalk. The leaves appear to wrap around and clasp the stem.


Fig 3 S. Navie

Paterson's curse flowers are mostly blue (fig. 4), but can occasionally be pink or more rarely white. They are funnel-shaped, 20–30 mm long and are held in clusters at the ends of the branches. The flower base is surrounded by 5 green bristly sepals (the calyx) 8–11 mm long. These can extend up to 15 mm when the plant is fruiting. The flower tube contains five filaments (stamens), with the two longest ones protruding beyond the petals.


Fig 4 S. Navie

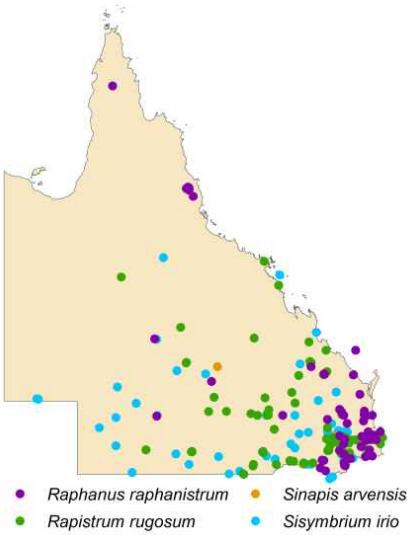
Each flower produces four seeds (or nutlets) that are held within the bristly calyx once flowering is finished. The seeds are up to 3 mm long and 2 mm wide with a rough wrinkled coat. They are dark brown to grey and angular. Often three seeds are dispersed with one remaining within the bristly calyx where it can then catch onto animal fur or clothing. Seeds can germinate at any time of the year when conditions are suitable. Densities of up to 30,000 seeds per square metre of soil is possible and the seeds can remain viable for up to seven years, further hindering eradication efforts.

Impacts

Paterson's curse quickly out-competes pasture species for nutrients, water, light and space. The result is a loss of biodiversity, pasture yield and productivity, a decline in soil fertility and a decreased value for crops contaminated with Paterson's curse. The seeds may also be found as a contaminant of grain. Increased land management costs may be incurred for control and for the application of fertiliser to depleted soils. Regional biodiversity declines as a result of native flora being out-competed.

Toxicity

All above ground parts of Paterson's curse contains pyrrolizidine alkaloids and nitrate. It is toxic to stock, especially pigs, poultry, cattle and horses. The bristles can cause irritation in the udders of milking cows and a skin rash in humans. The pollen can also cause allergies.



invasive brassicas

wild radish (*Raphanus raphanistrum*)
turnip weed (*Rapistrum rugosum*)
wild mustard (*Sinapis arvensis*)
London rocket (*Sisymbrium irio*)
Not declared, toxic

Family: Brassicaceae

Origins


Fig 1

Cultivated crops such as broccoli, cabbage, cauliflower and kale are all members of the Brassicaceae family. While there are many native species of brassica in Queensland, several non-native species have become naturalised and some, highly invasive. Wild radish (*Raphanus raphanistrum*) is native to Asia and possibly the Mediterranean while wild mustard *(Sinapis arvensis)* has a native range restricted to the Mediterranean. Turnip weed (*Rapistrum rugosum*) is native to parts of Eurasia and Africa. London rocket (*Sisymbrium irio)* has the most widespread native range including northern Africa, southern Europe, the Middle-East, western Asia, Pakistan and western China.

Known invasion pathways

Invasive brassicas are often found in disturbed sites and waste areas, along roadsides and waterways. They are weeds of crops, pastures and floodplains, particularly following autumn or winter rain. They also invade open woodlands and other natural vegetation. Reproduction is only via seed. Seed can be spread short distances by wind, water, animals and human activities. Contaminated fodder, seed and other agricultural produce is thought to be the most significant means of long range spread. Figure 1 shows wild radish (*Raphanus raphanistrum*) emerging in bands where fodder in round bales was rolled out prior to winter rains.

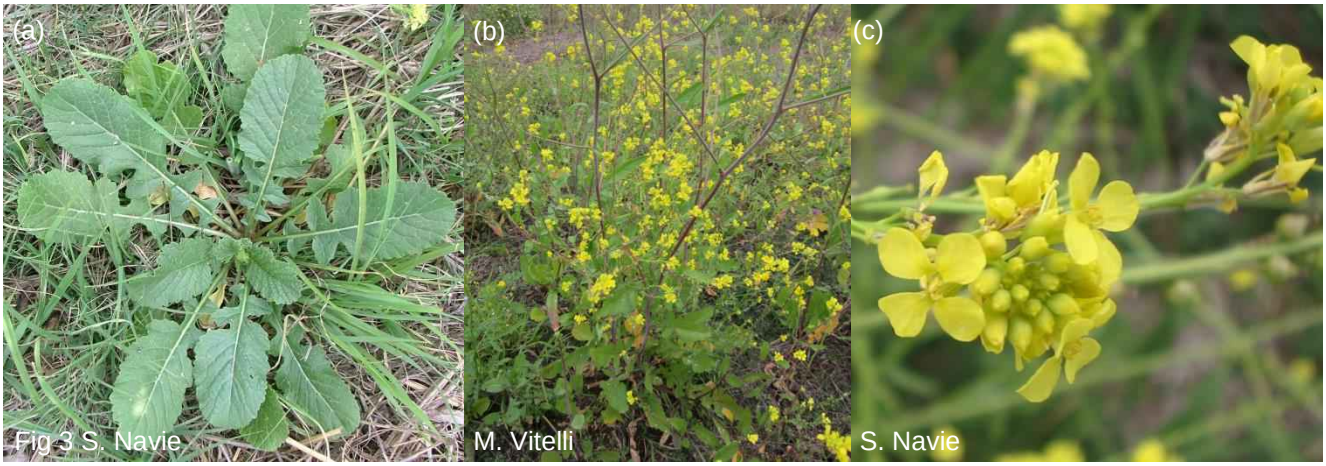
Impacts

Invasive brassicas can out-compete crops and pasture species for space, moisture and nutrients, reducing productivity and increasing control and harvesting costs.

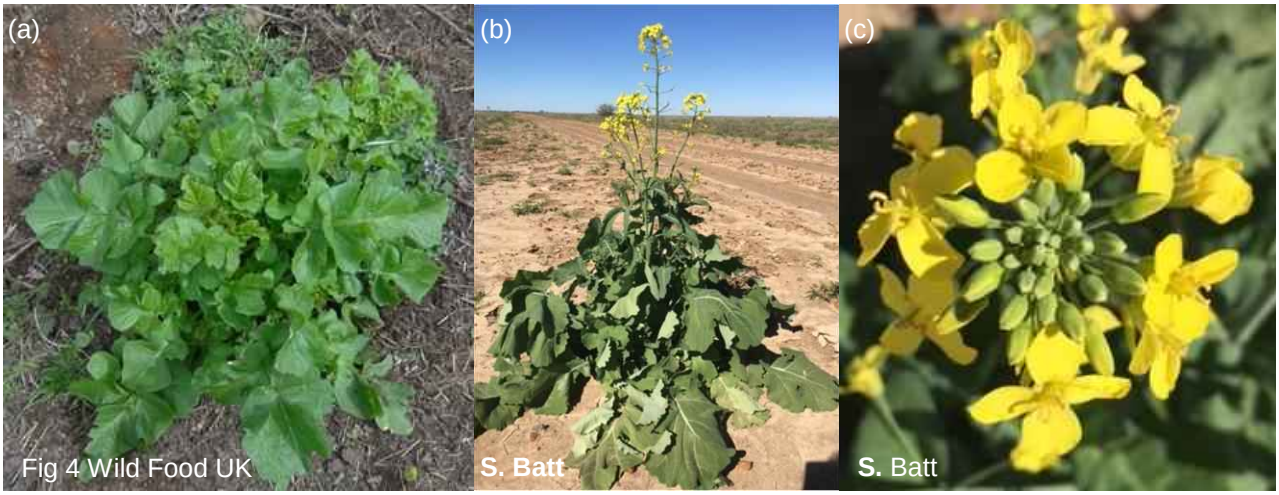
Description

Wild radish (*Raphanus raphanistrum*) is an upright and short-lived herb growing 40 cm–1.5 m tall. It initially grows as a low rosette of large lobed leaves (fig. 2a). As it grows, the upper leaves become narrower and smaller, with fewer lobes (fig. 2b). These leaves are arranged alternately around the stem and are green to bluish green and are covered in stiff hairs, making the leaves feel slightly rough. Flowering occurs between winter and early summer. Wild radish flowers can be white, yellow, pink or purplish and are 18–40 mm wide (fig. 2c). Each flower has four petals held in clusters at the end of the branches. The fruits are pods 3–9 cm long and 3–6 mm wide with a pointed beak at one end.

Turnip weed (*Rapistrum rugosum*) is an annual or biennial herb that can grow 15 cm–1 m tall. The plant is covered in short, stiff hairs. Young plants are a basal rosette of long (25 cm) leaves which have approximately three pairs of lobes (fig. 3a). The upper leaves are smaller and toothed and alternate around the stem (fig. 3b). The flowers have 4 yellow petals with dark veins and appear in August (fig. 3c). Pods are 5–10 mm long and can produce up to 8000 seeds per square meter. Seeds can remain viable for up to 4 years.



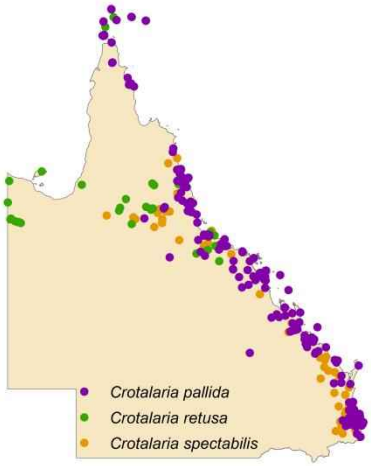
Wild mustard (*Sinapis arvensis*) is an erect annual herb growing to 80 cm tall. The stems are branched and are covered in coarse, spreading, white hairs. At the junction where new stems grow from older stems, there can often be a reddish-purple ring or patch. The leaves of wild mustard are highly variable. Those closest to the ground are stalked and grow up to 18 cm long and 5 cm wide (fig. 4a). They are rough to touch, have teeth along their margin and are generally broadest towards the leaf tip. Upper leaves are smaller and toothed, but are not stalked (fig. 4b). Flowers are held at the top of the stems and are approximately 1.5 cm wide with four pale yellow petals (fig. 4c). Pods are 3–5 cm long with a pointed beak at one end and contain small black seeds.



London rocket (*Sisymbrium irio*) is an erect annual herb growing up to 60 cm tall. The basal leaves are broad and often lobed (fig. 5a) while the upper leaves are smaller and narrower (fig. 5b). Flowering occurs from July to December. Its flowers have four pale yellow petals (fig. 5c). The thin pod is up to 5 cm long (fig. 5c), is green when ripe and contains small red seeds.

Toxicity

Wild radish, turnip weed and London rocket can be toxic to ruminants as they contain nitrate and sulphur, which can cause Polioencephalomalcia. Wild radish, turnip weed and wild mustard contain glucosinolates which can affect herbivores and ruminants. Wild radish also contains S-methylcysteine sulphoxide, which can affect ruminants. Flowering and fruiting plants are the most toxic. It is important that livestock are not confined on these weedy brassicas only.



rattlepods (*Crotalaria pallida*,*Crotalaria retusa* and *C. spectabilis*)

Not declared, toxic

Family: Fabaceae

Origins

Queensland is home to approximately 50 native species, subspecies and varieties of rattlepod. Twenty-two non-native rattlepods have been introduced into Queensland. The country of origin for most of these species is difficult to determine due to their world-wide cultivation and naturalisation, however, most are thought to have originated from the temperate areas of Africa, Asia, India and China. Some non-native rattlepods escaped cultivation as garden ornamentals to become naturalised in Australia. Others were initially cultivated as green manure crops and ground covers to reduce erosion. Non-native rattlepods have now become widely naturalised in Queensland. Three of the common introduced species are described below.

Known invasion pathways

Non-native rattlepods are often found along waterways and floodplains on moist, light, sandy and alluvial soils. They are also found in disturbed areas such as roadsides and on agricultural land. Rattlepod plants have a fast growth rate allowing them to quickly spread and take over, displacing existing vegetation. They are opportunistic colonisers of disturbed ground, infesting farm land, roadsides, railway lines, waste areas, parks and gardens. Rattlepod seeds can be spread as a contaminant of agricultural seed and fodder and as a contaminant on vehicles, farm equipment and machinery.

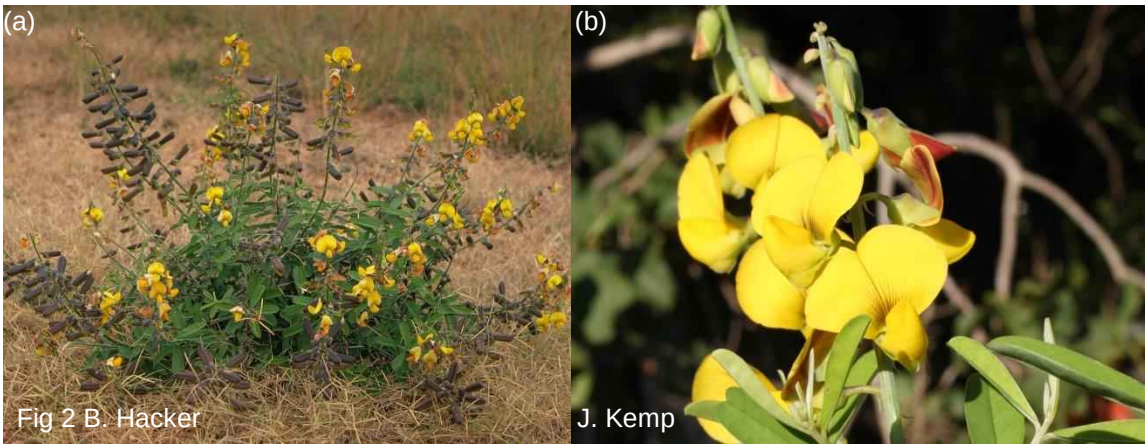
Description

Streaked rattlepod (*Crotalaria pallida*) is an erect annual or short-lived perennial shrub 1.5 to 3 m tall with ribbed, hairy stems. Its leaves alternate along the stem and are made up of 3 leaflets, each 2.5–7.5 cm long and 10–14 mm wide (fig. 1a). Flowering is from autumn to spring. The flowers are yellow with reddish brown streaks and are held on stalks above the plant up to 30 cm long (fig. 1a). The fruits are inflated pods 3.5–4.5 cm long (fig.1b). Each pod contains numerous kidney shaped brown to dark green seeds that are about 3.5 mm long.

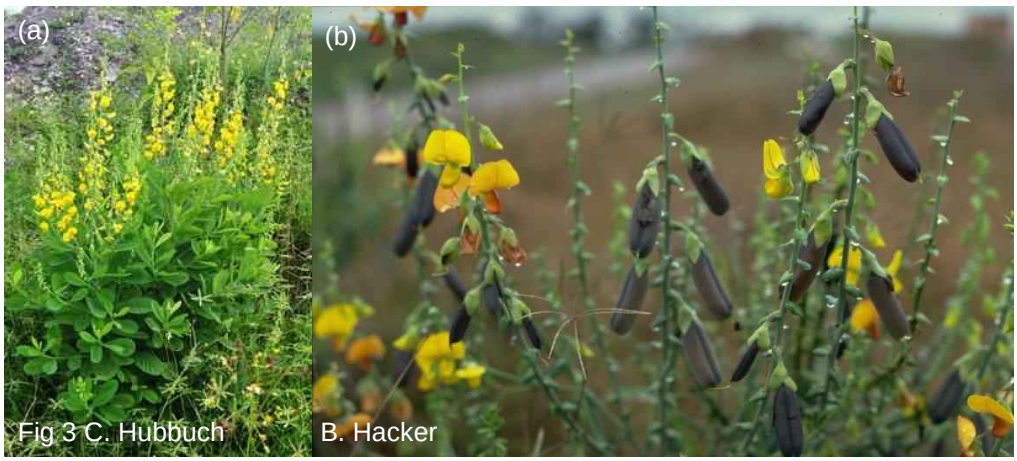
Fig 1 S. Navie

J. Thompson

Wedge-leaf rattlepod (*Crotalaria retusa*) is an erect annual herb 0.5-1.5m high with slightly ridged, hairy stems (fig. 2a). Its leaves are alternate, simple, 3–10 cm long and 1–4 cm wide. The flowers appear from March through to August and have orange to yellow petals (fig. 2b). The pods are dark brown to black at maturity, 2.5–4.5 cm long with numerous golden brown to brown seeds 4–4.5 mm long.



Showy Crotalaria (*Crotalaria spectabilis*) is an erect annual growing 1.5–2 m tall (fig. 3a). Its leaves are simple, narrow and rounded in shape, 5–10 cm long and 8–40 mm wide. The leaves and stems are more or less hairless. Flowering is mostly during summer and autumn. The yellow flowers are about 20 mm long, large and showy and are held on a stem 13–40 cm long (fig. 3b). The pod is 40–65 mm long, hairless and contains numerous yellow, ochre and black seeds.

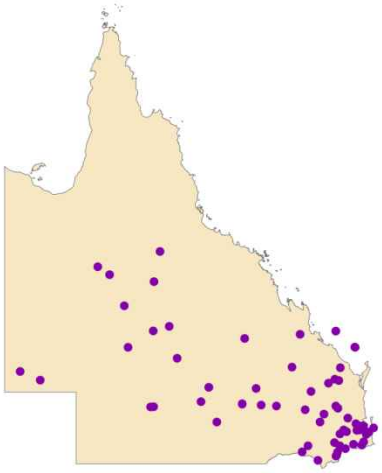


Impacts

Rattlepods compete with pasture and crop species for water, nutrients, space and sunlight, resulting in diminished yields. Similarly, they can out-compete native plants, threatening the biodiversity of natural habitats.

Toxicity

The presence of pyrrolizidine alkaloids in all aboveground parts of the plant, including the seeds, makes the plants toxic to stock. Pigs, poultry, cattle, horses and humans can be affected. *Crotalaria pallida* may cause lung damage in sheep and *Crotalaria retusa* may cause liver damage in ruminants. Contaminated agricultural seed, grain or hay is unable to be sold due to the potential for stock poisoning.



shepherd's purse (*Capsella bursapastoris*)

Not declared, toxic

Family: Brassicaceae

Origins

Shepherd's purse is an annual herb that is thought to have originally come from Europe and Asia, but is now widely naturalised world-wide. This hardy herb can grow on a wide range of soils and is often found as a weed of roadsides, cultivation or disturbed soils. Shepherd's purse is a species that is often first to colonise disturbed areas.

Known invasion pathways

The seeds of shepherd's purse are sticky, which allows them to adhere to stock, feral and native animals, vehicles and farm machinery. It is found as a contaminant of grain, hay and other fodders. Shepherd's purse often establishes along roadsides, in gardens, lawns and other cultivated areas. The species is able to germinate and thrive in a wide range of environments, often emerging following a disturbance.

Fig 1 S. Navie

Description

Shepherd's purse is an erect annual herb 8–50cm tall (fig. 1). The flowering stem extends to 50 cm from a basal rosette of leaves that are variable in shape but with lobed margins. Flowering stems are upright, with stem leaves generally smaller, simple and clasping onto the stem. The lower stem and leaves are hairy.

Fig 2 S. Navie

Shepherd's purse flowers open up sequentially over time along the length of the stem, allowing both flowers and fruit to be borne on the stem at the same time (fig. 2). Flowering is from August through to November, but if ideal conditions are met, shepherd's purse can flower and fruit year round. Shepherd's purse flowers are small, (2–3 mm diameter) and white with 4 petals (fig. 3). The fruit are a flattened triangular, heart-shaped pod or capsule with two chambers, each containing numerous seeds (fig. 2). The capsule ripens from green to brown, with mature seeds being


Fig 3 J. Robertson

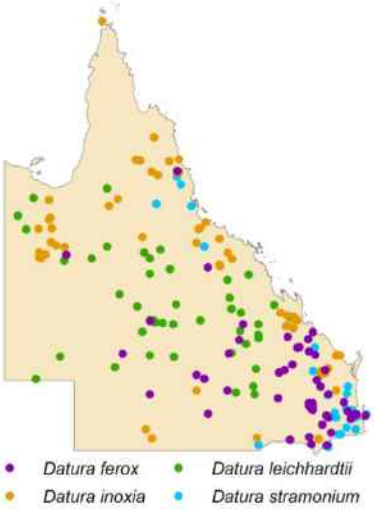
yellow to orange in colour. The seeds can remain viable in the soil for a number of years.

Impacts

Invasive weeds such as Shepherd's purse can outcompete agricultural crops and native species for resources such nutrients, water, light and space. This species is relatively unpalatable to stock, further increasing its tendency to become dominant over time. Shepherd's purse is also a host to insects, fungi and viruses, some of which can reduce crop yield.

Toxicity

Shepherd's purse contains sulphur and nitrate and may be toxic to ruminants and pigs. There is evidence to suggest that Shepherd's purse may taint the milk of stock that have grazed on it as well as discolour egg yolks of poultry.



thornapples

fierce thornapple (*Datura ferox*)
downy thornapple (*D. inoxia*)
Leichhardt's thornapple (*D. leichhardtii*)
common thornapple (*D. stramonium*)
Not declared, toxic

Family: Solanaceae

Origins

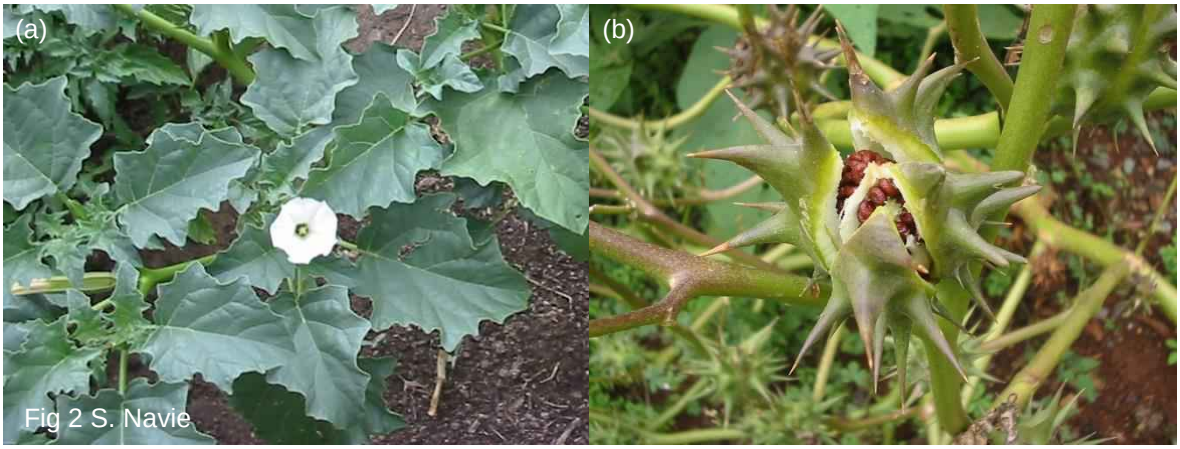
Thornapples (*Datura* spp.) are a group of weedy annual or short-lived perennial plants originating in the tropical regions of North and South America. Historically, these plants have been cultivated for their fragrant flowers and for ritualistic uses, however, it is thought that thornapples were accidentally introduced into Australia as contaminants in fodder or pasture seed.

Known invasion pathways

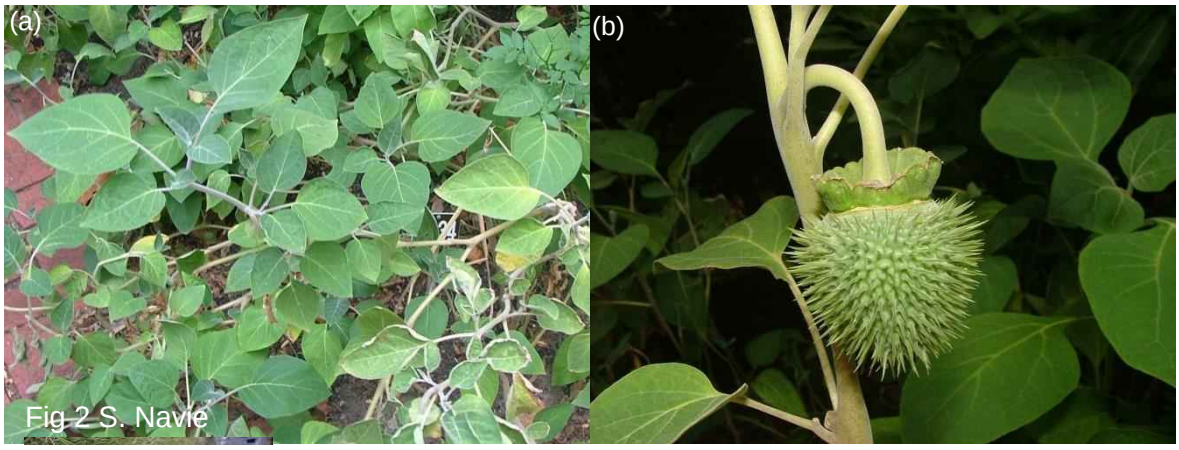
Thornapples thrive in disturbed environments such as roadsides, agricultural and pasture lands, rail reserves and urban waste areas. They are readily dispersed by seed and can be spread as a contaminant in fodder. Their spine covered capsules and seeds can float, distributing seed downstream along waterways. The capsules are adapted to attach to animal fur, leading to infestations in and around stockyards. Thornapple seeds can also be spread in mud carried on farm machinery, vehicles and in the hooves of stock. The seeds can remain dormant in the soil for a number of years, germinating when the soil is disturbed.

Descriptions

Fierce thornapple (*Datura ferox*) is a stout annual herb reaching 1.5 m tall (fig. 2a). It is hairless or sparsely hairy at maturity. Its stems and branches are many-forked and green to purplish towards the base. Leaves are on long slender stalks, alternate along the stem and range from oval to rounded-triangular in shape. The margins are lobed, either shallowly toothed or wavy and are up to 14 cm long and 16 cm wide.Its trumpet shaped flowers are 4–6 cm long, white, solitary, 5 lobed and are held on short stalks in the forks of the branches (fig. 1a). The fruit is a spine-covered capsule, ellipsoid in shape, 2–4 cm long and 2–3 cm in diameter (fig. 1b). The capsule splits open to disperse many black or grey seeds that are 4–5 mm long.



Downy thornapple (*Datura inoxia*) can grow up to 1 m high and about 2 m in diameter (fig. 2a). The stems and leaves are covered in soft hairs, giving the whole plant an overall greyish appearance. Its leaves are simple, alternate, and have conspicuous pale venation (fig. 2a). The leaves grow up to 20 cm long, with the margins being slightly wavy to irregularly lobed either side of the midrib. The flowers are tubular to trumpet shaped, white with green veins, 12–19 cm long with a fragrance that is more obvious at night. The fruit capsule is about 5 cm in diameter, oval in shape with many slender spines on its surface (fig. 2b). Typically the capsule stalk is bent sharply downwards. The capsule splits open on maturity to disperse numerous brown seeds 4–5 mm long.



Leichhardt's thornapple (*Datura leichhardtii*) is a stout, much branched annual herb or shrub (fig. 3a). The leaves are alternate in arrangement and reach up to 8 cm long and 2–4.5 cm wide with a toothed, wavy margin. The flowers are usually cream, 4–7 cm long and trumpet shaped, with the five petals tapering to a fine point. The seed capsule is round, 2–3 cm long and covered with numerous slender spines (fig. 3b). The seeds are light brown to grey brown and 4–5 mm long.

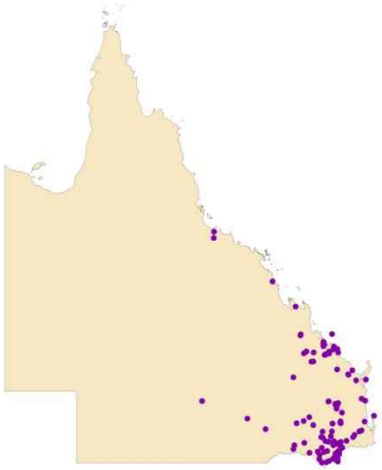
Common thornapple (*Datura stramonium*) is an erect, bushy annual herb or shrub to 1–1.5 m tall (fig. 4a). It has smooth, hairless stems and many branches. The leaves are arranged alternately along the stem and are bright green and broad, up to 36 cm long and 20 cm wide. The leaves are soft with a deeply lobed margin. Flowering occurs through summer and into autumn. The flowers are trumpet shaped with 5 petals, each with a pointed tip (fig. 4a). The petals are white to violet in colour, each with a green calyx enclosing their bases and extending half way up the length of the flower. The fragrant flowers partially open up at night. The seed capsule is round and up to 4.5 cm in diameter (fig. 4b). It is covered with numerous slender spines and has four chambers that split open at maturity, dispersing black seeds 2.5–4.5 mm long.

Impacts

Thornapples aggressively compete with crops for soil moisture and nutrients. Productivity losses of up to 90% have been recorded in mung bean and soybean crops as a result of thornapple infestations. There are increased costs associated with harvesting crops contaminated with thornapple as the dense, coarse shrubs interfere with harvesting machinery. Contamination in grain crops is also difficult to remove. Thornapples compete with native flora, displacing native grasses and ground covers. Dense infestations, especially those along river flats, reduce native fauna access to food and water.

Toxicity

Datura seeds, leaves and flowers all contain tropane alkaloids that are toxic to all animals. Cattle, sheep, horses, pigs, poultry and humans have all been poisoned by ingesting seeds. Plants parts incorporated into hay or silage remain poisonous and the toxic seeds can contaminate grain fed to livestock. *Datura leichhardtii* and *Datura stramonium* also contain nitrates that can affect ruminants.



African lovegrass (*Eragrostis curvula*)

Not declared

Family: Poaceae

Origins

African lovegrass is a perennial grass native to southern Africa. It is thought to have been accidentally introduced to Australia prior to 1900 by way of contaminated pasture seed. African love grass was later deliberately introduced to assess its potential as a fodder species. African lovegrass is now known to be a highly invasive species that is difficult to eradicate or even control once established. It is a major weed of grazing land throughout Australia.

Fig.1 DAF

Known invasion pathways

African lovegrass is an aggressive coloniser of disturbed areas and sparse pastures with low ground cover (less than 70%). It can be found along roadways, forest tracks, rail lines, waterways and in some coastal areas. The seeds can be spread by machinery (graders and slashers), farm vehicles and cars, water and over short distances, wind. It may be transported as a contaminant of fodder or via the hooves and fur of livestock. African lovegrass seed can remain viable in the gut of cattle for up to ten days, allowing it to be spread via manure.

Description

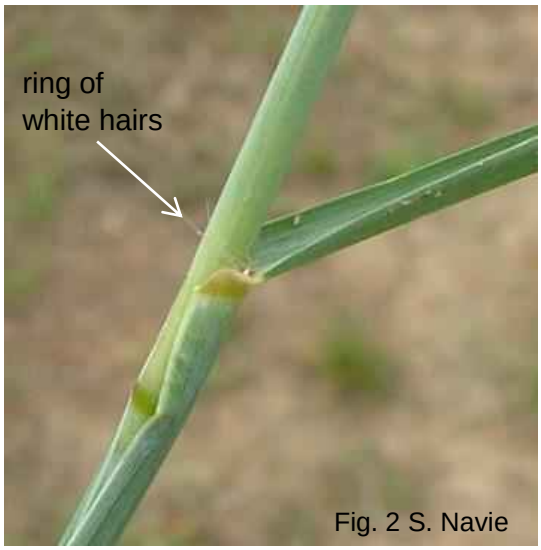


Fig. 2 S. Navie

African lovegrass thrives on red sandy soils of low fertility, and copes with low or erratic rainfall. It is a robust, densely tufted perennial that grows 30–120 cm tall (fig.1). Its habit is generally erect, but it can bend at the lower nodes giving the whole plant a drooping appearance. The root system of African lovegrass is fibrous and can potentially penetrate to a depth of 5 m and spread up to 1 m laterally. The leaf blades are dark to bright green in colour, 23–35 cm long and 3 mm wide with an in-rolled margin. The leaves are rough to the touch, hard to break and the tips curl on drying. A ring of white hairs can be seen around the stem where the leaf sheath joins the leaf (fig. 2). A distinguishing feature of the plant is that the leaf sheaths at ground level are covered with fine silky hairs (fig. 3).

Initially the flower head is compact, spreading to form loose open panicles on maturity (fig. 4). Flower heads can grow up to 30 cm long, are grey to leaden-green, maturing to a straw colour. Flower heads are typically flattened with a herringbone shape pattern having 4–13 flowers that are 4–10 mm long and 1–1.5 mm wide. The seeds are 0.3–0.7 mm long, rounded in shape and can range from whitish to yellow, brown to dark orange or black in colour. African lovegrass usually germinates in autumn or spring, flowering and seeding in summer, however, it can germinate at any time of the year given good conditions and can flower all year round in coastal areas.

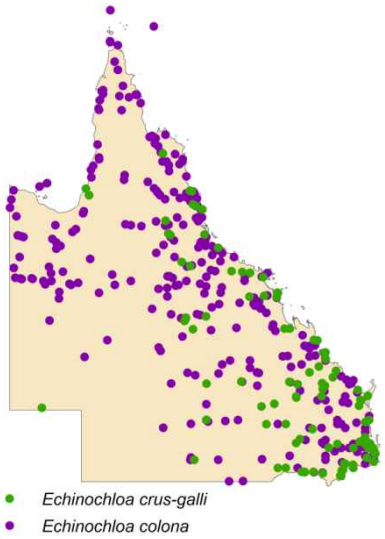
Fig. 3 W. Smith

Impacts

African lovegrass is an opportunistic and aggressive coloniser that produces large quantities of seed. It can out-compete both pasture species and native grasses, potentially reducing the livestock carrying capacity for landowners and reducing biodiversity. While African lovegrass may be appeal to stock as a food source when young, the grass becomes fibrous and dry as it ages making it unpalatable and difficult to digest. This lack of grazing can allow it to become dominant. African lovegrass can also contaminate lucerne and other summer crops.


Fig. 4 S. Navie

African lovegrass may present a major fire hazard during the dry months as it forms dense monocultures and potentially large fuel loads. Fires from this grass burn extremely hot and are very difficult to control. After a fire, it out-competes regenerating native grasses and other plant species threatening biodiversity and ecosystem function.



barnyard grasses

barnyard grass (*Echinochloa crus-galli*)
awnless barnyard grass (*E. colona*)

Not declared, toxic

Family: Poaceae

Origins

Barnyard grasses are highly invasive annual grasses that can significantly impact agricultural production in Queensland. Barnyard grasses are thought to be native to southern Europe and India, however both species discussed here are now so widely naturalised throughout the tropical, sub-tropical and warmer temperate regions of the world, it is difficult to establish their country of origin. Barnyard grasses may originally have been introduced as potential pasture species or may have arrived as contaminants of crop seed. Both species are now widespread throughout Queensland, New South Wales and the north western region of Western Australia.

Known invasion pathways

Barnyard grasses can be spread by wind, irrigation water, livestock, agricultural equipment and vehicles, birds (especially water birds) or as a contaminant of fodder or soil. In some instances, barnyard grasses may be spread vegetatively via plant fragments. Barnyard grasses are often found in disturbed areas along roadsides, footpaths, drains, ditches and waterways. Damp habitats with heavy soils such as swamps or the margins of garden ponds, lakes and wetlands are particularly susceptible to invasion. Barnyard grasses can also invade native grasslands and forests.

Description

Barnyard grass *(Echinochloa crus-galli*) is a highly variable clumping annual summer grass growing to 1.5 m tall (fig. 1a). Its leaves are dark green and flat with a prominent midrib (fig. 1b). The leaves grow up to 30 cm long and 20 mm wide and taper to a point. Leaves are usually hairless or slightly hairy on the margins near the base. The flower head is a green or purple panicle (fig. 1c) with up to 15 spikelets on each branch. Flower spikelets are arranged in two irregular rows along each branch and are green with a purple tinge. Seeds usually have a short awn (spine) but the awn can occasionally be up to 50 mm long. The seeds are pale brown when mature, curved along one side and flat along the other, 3–4.5 mm long (excluding the awn) and 1–2 mm wide. Each plant can produce up to 40,000 seeds. The seed often germinates in late winter through to summer, with seed heads appearing 6–8 weeks later in December or early January.

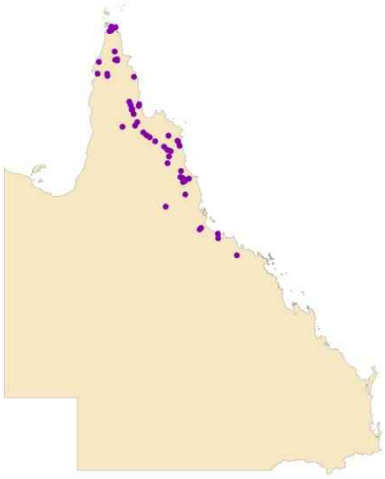
Awnless barnyard grass (*Echinochloa colona*) is a tufted and fibrous annual summer grass growing up to 1m tall with shallow roots (fig. 2a). The leaves are flat, light green with occasional bands of purple (fig. 2b). The leaves are hairless, 40–100 mm long and 3–8 mm wide with a pointed tip. The flower head is erect or nodding, green or purple tinged, 5–15 cm long with numerous branches 2–4 cm long (fig. 2c). Flower spikelets are arranged in 4 irregular rows along the branches. Spikelets are about 3 mm long with no significant awn (spine). The seeds are 1.7–2 mm long, strongly curved on one side and flat along the other. They are whitish in colour when mature. In general, *Echinochloa colona* is smaller than *E. crus-galli* with a more spreading or open growth habit with more branching from the base.

Impacts

Both barnyard and awnless barnyard grass are highly invasive, aggressively competing for nutrients, water and light. They are major weeds of rice, sugarcane, maize, beans and sorghum crops. An infestation of *Echinochloa crus-galli* can remove up to 80% of available soil nitrogen from a paddock, resulting in a substantial reduction in yield or even crop failure. Barnyard grasses can also out-compete native species, adversely affecting natural systems and biodiversity. Infestations are difficult and costly to control once established.

Toxicity

High levels of nitrate have been recorded in barnyard grasses and may potentially be toxic to ruminants.



gamba grass (*Andropogon gayanus*)

Restricted (Category 3)/WONS

Family: Poaceae

Origins

Gamba grass is a tall perennial tussock grass native to the tropical savannas of Africa. It was first introduced to the Northern Territory in 1931 as an improved pasture species, with Queensland following in 1942. The sale of seed saw large-scale planting begin around 1983. Gamba grass is now naturalised in the eastern Kimberley region of Western Australia, parts of the Northern Territory, especially around Darwin, as well as in the coastal and sub-coastal areas of northern Queensland. Gamba grass covers around 60,000 ha across Cape York, the northern Gulf and the Atherton Tablelands.

Fig.1 J. Clarkson

Known invasion pathways

Gamba grass is a prolific producer of very light seeds, allowing wind dispersal over short distances. Seed can also be moved via water along waterways or overland during flood events. In the past, the sale of gamba seed for use as a commercial pasture plant greatly accelerated its spread. It is spread as a contaminant in fodder or in mud on stock or vehicles. Roadside slashers and farm machinery also spread gamba grass seed. Disturbed areas are particularly vulnerable to invasion by gamba grass which, once established, can out-compete native pasture species.

Fig. 2 J. Clarkson

Description

Gamba grass is a large perennial grass growing to 4 m tall (fig. 1) and up to 70 cm in diameter. It has an extensive root system which can spread up to 1 m away from the plant. Surface roots aid water absorption in good seasons and while the young plant is establishing. During prolonged dry seasons or drought, however, deeper roots are able to access water sources further below the surface.

The robust, rigid stems are covered with soft, fine hairs. The leaves are 30–60 cm long and up to 3 cm

wide. They are softly hairy and have a distinctive white midrib. Gamba grass flowers in April and sets seed from July to August, with each plant capable of producing up to 244,000 seeds per year. The seeds are held in a fluffy V-shaped seed head (figs. 2 and 3).


Fig.3 J. Clarkson

Impacts

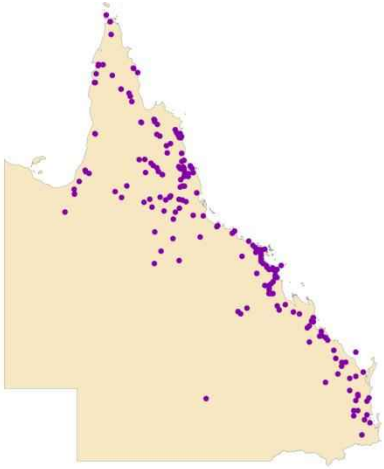
The potential for gamba grass to invade and dominate a wide range of Queensland's natural habitats from wetland margins through to upland savannas is enormous. It spreads quickly into new areas via watercourses and disturbed roadsides. Gamba grass is able to out-compete native species for space and resources. Its extensive root system takes up large volumes of water and nutrients, potentially altering catchment hydrology and nutrient cycles. It can invade conservation areas, threatening habitats and biodiversity.

Fig.4 Northern Territory Police, Fire and Emergency Services

The large biomass of gamba grass makes it highly flammable, potentially leading to intense wildfires (fig. 4). Areas infested with gamba grass can have a fuel load of up to eight times that of non-infested woodlands or pastures. Gamba grass plants are also relatively fire tolerant.

Repeated intense gamba grass fires can kill trees and shrubs, allowing regenerating gamba grass to out-compete recruiting native grasses, shrubs and trees. Over time, woodlands can be transformed into non-native grasslands. Increased fire frequency and intensity resulting from gamba grass also poses a serious threat to human safety and property.

While young gamba grass is grazed by cattle, it is not palatable to stock if left to grow to maturity as it becomes coarse and fibrous. As a result, gamba grass can become dominant in ungrazed areas, reducing productivity and increasing control costs.



grader grass (*Themeda quadrivalvis*)

Not declared

Family: Poaceae


Fig.1 K. McDonald

Origins

Grader grass is an erect, tufted annual grass (fig. 1) native to India, Nepal and parts of South East Asia with an annual rainfall of 1000–1500 mm. It was accidentally introduced into Australia in the 1930s as a contaminant of pasture seed, with infestations then following in the Northern Territory in the 1960s. It is now naturalised and widely distributed with infestations recorded throughout coastal and sub-coastal regions of Queensland and the Northern Territory, as well as northern Western Australia and coastal New South Wales. Although not declared, grader grass is regarded as an invasive weed and has spread rapidly along the east coast of Queensland. It is also now spreading into drier, inland areas of the state.


Fig. 2 DAF

Known invasion pathways

Grader grass will establish and thrive in areas of disturbance or low vegetation cover such as roadsides, waste areas, overgrazed pastures and crops. It can also invade open woodlands and grasslands. Seed can be spread as a contaminant of fodder or pasture seed, soil or mud, on vehicles or farm machinery, slashers and road maintenance machinery. Seeds can also be transported on wool or on the fur of livestock, feral or native animals. Grader grass can also be spread naturally via wind or water movement. Slashing, burning or mowing increases the germination of grader grass seed, allowing for greater establishment and spread of infestations.

Description

Grader grass is a robust, erect, annual grass growing 50–200 cm tall, with cane-like stems and long, branched seed heads (fig. 2). As the plant matures, the stems, leaves and seed heads become reddish brown to golden brown in colour. Grader grass stems are 4–6 mm thick and hairless. The leaves are 7–60 cm long and 1–7 mm

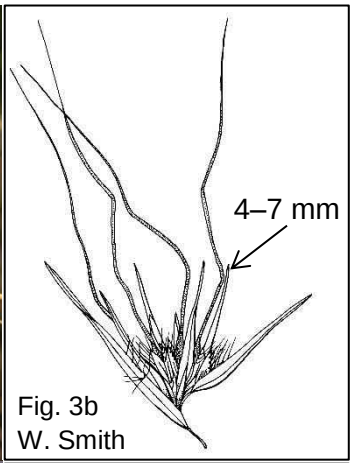
wide. The seed heads are 15–60 cm long and are comprised of several drooping triangular or fan shaped clusters 1–3 cm long that are interspersed with leafy bracts that are about 2 cm long (fig. 3a and b). Mature seeds are 4.5–5.5 mm long with a distinctive tuft of brown hairs at the sharply pointed base and a large twisted, bent awn 10–45 mm long. Grader grass is a prolific seed producer, with each seed head potentially carrying up to 1000 seeds. Flowering is most common in summer and autumn, with seeds able to germinate at any time throughout the year if conditions are ideal. Seed heads can appear within 5–6 weeks and the plant can set seed at 10 weeks of age.

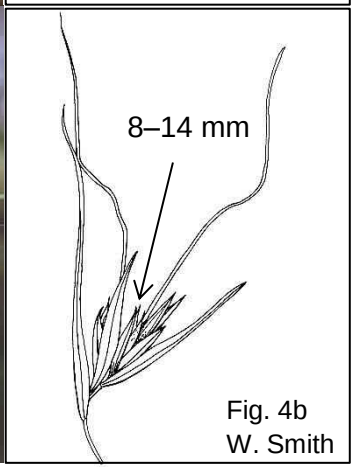
Grader grass can be confused with native kangaroo grass (*Themeda triandra* fig.4a and b). Kangaroo grass is a perennial rather than an annual. Spikelets within the seed head (involucral spikelets) are longer in kangaroo grass (8–14 mm, fig. 4b) than in grader grass (4–7 mm, fig. 3b), however the complex structure of both flower heads can make this very difficult to measure.

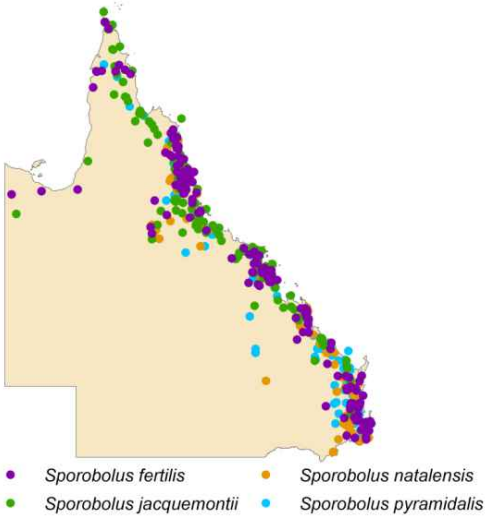
Impacts

Grader grass can form monocultures, threatening native biodiversity by colonising, dominating and replacing native grasslands, savannas, woodlands and rangelands. It has a greater biomass than many native species, increasing the frequency and intensity of wildfires. Fires encourage seed germination and can alter the fire regime of an ecosystem. More frequent or intense fires can lead to a reduction in tree coverage changing native savanna woodlands to exotic grasslands. The destruction of leaf litter and logs has a flow-on effect with potential loss of habitat for threatened fauna species.

While stock may readily graze on the younger grader grass plants, once it flowers, it becomes unpalatable. Grader grass can reduce the yield in sugar cane, lucerne and other legume crops. It can also invade grazing areas and dominate pasture species, leading to a loss in productivity.







rat's tail and Parramatta grasses

giant rat's tail grass (*Sporobolus natalensis*)
giant rat's tail grass (*S. pyramidalis*)
American rat's tail grass (*S. jacquemontii*)
giant Parramatta grass (*S. fertilis*)
Restricted (Category 3)

Family:Poaceae

Origins

Four species of non-native grasses in the genus *Sporobolus* are declared under Queensland's *Biosecurity Act 2014*: two giant rat's tail grasses (*Sporobolus pyramidalis* and *S. natalensis*), American rat's tail grass (*S. jacquemontii*) and giant Parramatta grass (*S. fertilis*). Both of the two species known as giant rat's tail grasses are native to Africa. American rat's tail grass is native to Mexico, Central America, the Caribbean and tropical South America. Giant Parramatta grass is native to the Indian sub-continent, eastern Asia and some western Pacific islands.


Fig. 1 M. Vitelli

Known invasion pathways

The declared rat's tail and Parramatta grasses all share similar habitats and invasion pathways. They are opportunistic, aggressive colonisers of ground with little or no cover as well as recently disturbed areas. They are common along roadsides and footpaths as well as open woodlands, native grasslands and degraded pastures. All are commonly spread by livestock and other animals, either through their manure or by seed attached to their bodies or hooves.

Rat's tail and Parramatta grasses are prolific producers of very fine seeds which disperse readily and can stay viable in the soil for up to ten years. The seed coat becomes sticky when wet, clinging to fur, clothing, vehicles and slashers. Seed can also be spread on farm machinery and earth movers. Infestations can arise from contaminated pasture seed or fodder, in turf, soil or mud, or via overland flooding.

Description

Declared rat's tail and Parramatta grasses are adapted to a wide range of soils and climatic conditions, resulting in a wide distribution across both coastal and sub-coastal eastern Australia. They are all very similar in appearance, making identification very difficult, especially in immature, grazed, slashed or diseased plants. They can also be very difficult to distinguish from native *Sporobolus* species when immature. Native species of *Sporoblous* are in general shorter and softer, with less dense seed heads than declared non-native species. In native species of *Sporobolus*, the stem can generally be seen between branches of the flower head (fig. 2a), whereas the stem is mostly obscured in flower heads of declared non-native species (fig. 2b, Appendix B).

A feature that may be helpful in identification is that the declared *Sporobolus* grasses **do not** have whorled lower branches at the base of the inflorescence but instead always have 1–2 branches at the base (figs. 2a and b). A number of native *Sporobolus* and non-declared non-native *Sporobolus* species also have this trait, however, so it is recommended that specimens suspected of being rat's tail and Parramatta grass be sent to the Queensland Herbarium for identification (Appendix A).

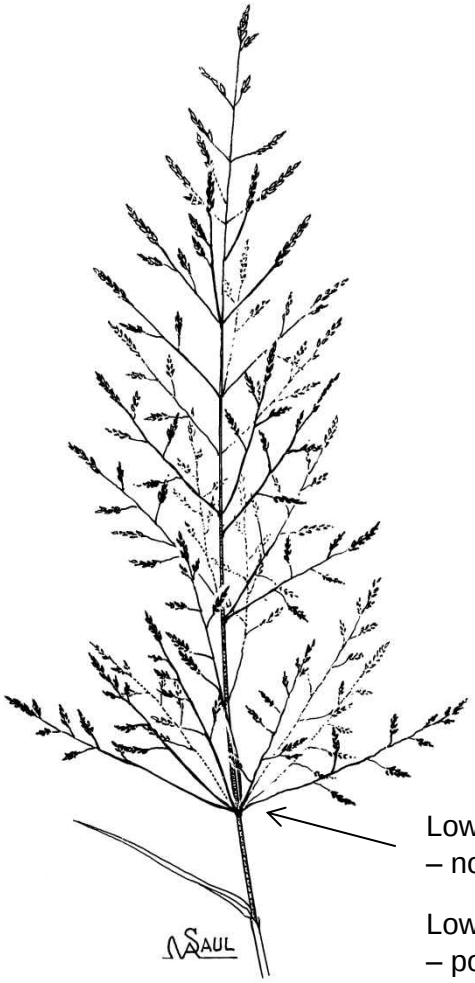


Fig. 2a M. Saul

Lowest branches whorled around the stem
– not a declared rat's tail or Parramatta grass

Lowest branches not whorled, only 1 or 2 branches
– possibly a declared rat's tail or Parramatta grass, further investigation required

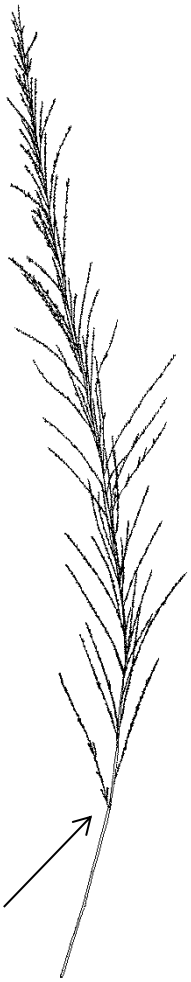


Fig. 2b W. Smith

Impacts

Declared rat's tail grasses have tough leaves that are unpalatable to stock. Native species are preferentially grazed, leading to an increase in declared *Sporobolus* grasses over time. These weed grasses are estimated to cost the grazing industry up to $60 million per year in lost productivity, control costs and lowered land values.

Declared *Sporobolus* grasses can invade and dominate natural areas causing significant degradation of native vegetation and habitats, especially during times of drought or after a fire. They are also highly flammable. To keep land clean of declared Sporobolus grasses, ensure healthy pasture coverage of perennial palatable species and treat new weed outbreaks quickly. Following good weed hygiene practices with vehicles, machinery and stock will help minimise their potential spread.

Giant rat's tail grass (*Sporobolus pyramidalis*) is a perennial grass growing 0.6–1.7 m tall and forming large dense tussocks (fig. 3a). The stems are 2–5 mm thick. Leaf blades are 20–60 cm long and 3–10 mm wide, flat or slightly rolled with pointed tips. The leaves are generally hairless and droop towards the ground. A fringe of small white hairs can be found where the leaf sheath meets the leaf blade. The seed head begins as a thin spike that matures and spreads into a pyramid shape (fig. 3b) with stiff branches 5–10 cm long. These bear flowers/fruits nearly to the base of the branch. Flower spikelets are dark green to grey-green, 1.7–2.2 mm long. Mature seeds are yellow-brown to reddish-brown, 0.8–1 mm long and are oblong to ovoid in shape.

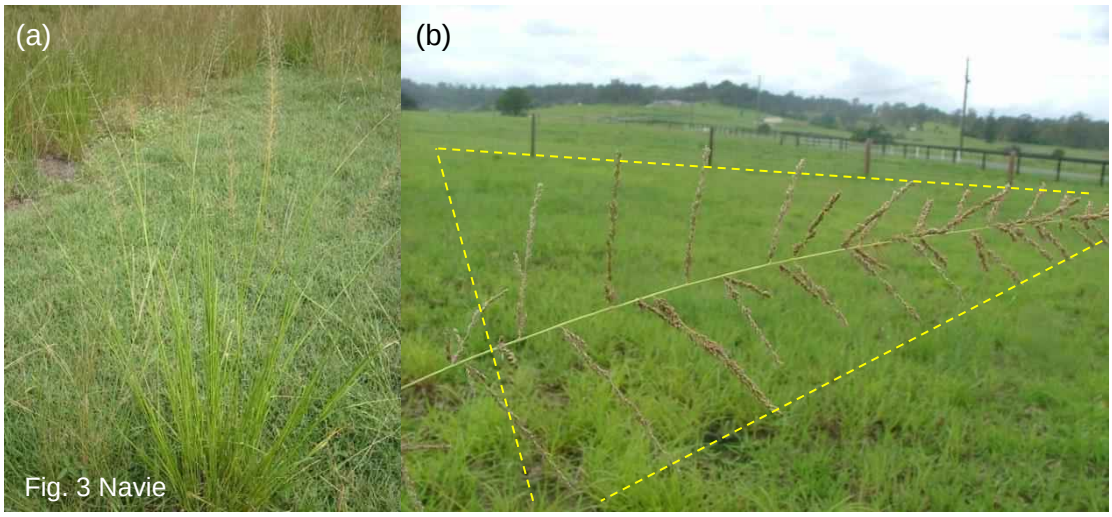


Fig. 3 Navie

Giant rat's tail grass (*Sporobolus natalensis*) is an erect, slender but wiry perennial grass growing 0.6–1.7 m tall and forms large, dense tussocks (fig. 4a). The plant has narrow leaf blades 20–30 cm long and 2–4 mm wide with pointed tips. The leaves are hairless with a small fringe of white hairs where the leaf blade meets the leaf sheath. The flowering heads are initially narrow but open and spread on maturity to 20–30 cm long and about 3 cm wide (fig. 4b). Branches along the flowering spikes are 3–7 cm long with each spikelet 1.6–2.3 mm long, dark green to greyish green in colour. Mature seeds are oval shaped, yellowish-brown to reddish brown in colour, 0.7–0.8 mm long and up to 0.6 mm wide.

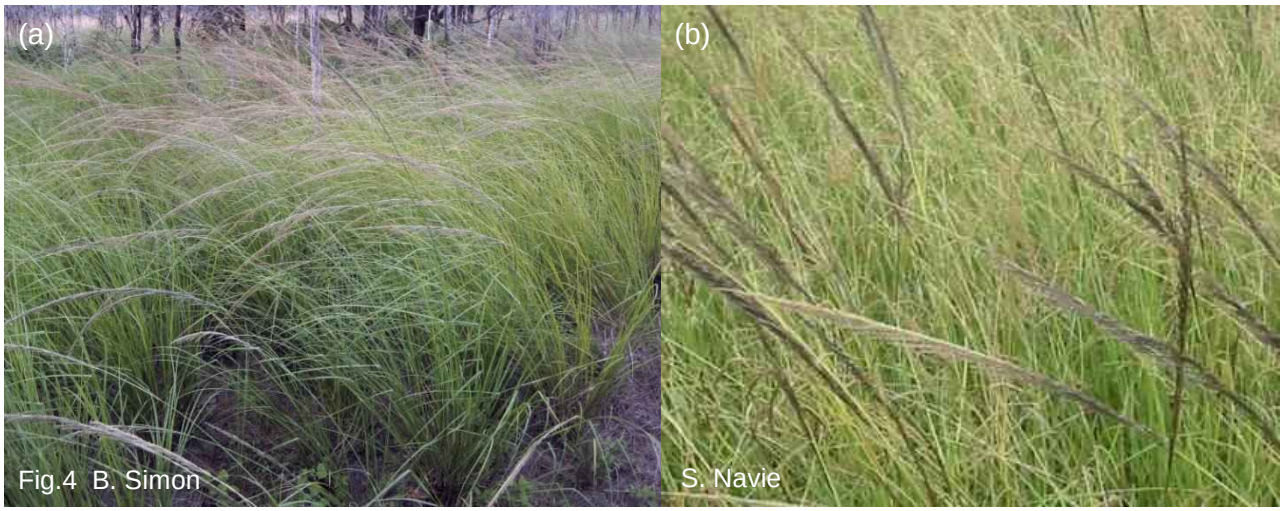


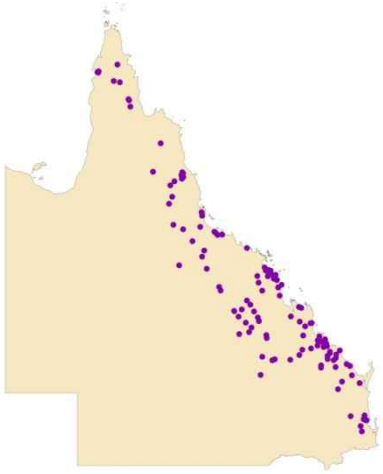
Fig.4 B. Simon S. Navie

American rat's tail grass (*Sporobolus jacquemontii*) is a tall clumping grass, very similar in appearance to both declared giant rat's tail grasses. It is shorter at 50–75 cm tall, but has been recorded up to 1 m in height with a densely tufted growth habit (fig. 5a). The leaf blades are up to 40 cm long and 2.5–3.3 mm wide. The leaves are hairless with pointed tips. A ring of tiny white hairs can be found where the leaf sheath meets the leaf blade. Seed heads are thin and long (8–25 cm), with branches 50–100 mm long that usually open to spread away from the main stem (fig. 5b). Flower spikelets are 1.5–2 mm long, dark green to greyish-green in colour, with each branch bearing flowers right down to its base. Mature seeds are reddish brown, oblong in shape, 0.8–1 mm long and up to 0.5 mm wide.

Fig. 5 S. McKenna D. Sharp

Giant Parramatta grass (*Sporobolus fertilis*) generally grows to 70–160 cm in height, but can reach 2 m and form dense tussocks up to 40 cm across (fig. 6a). The wiry stems of giant Parramatta grass are 2–5 mm thick with leaf blades 14–110 cm long and 1.5–5 mm wide. The leaves are hairless, drooping, flat or slightly rolled with pointed tips with a ring of tiny white hairs where the leaf blade meets the leaf sheath. Flower heads are dense and spike-like, up to 50 cm long and 1–2 cm wide (fig. 6b). Flower spike branches are 2–8 cm long, overlapping and are initially held close to the main axis, before opening out on maturity. Flowers are found almost to the base of the branches. They are dark grey green in colour with spikelets 1.5–2 mm long. Mature seeds are yellowish brown to reddish brown in colour, 0.8–1.2 mm long and 0.5–0.75 mm wide and oblong shaped.

Fig. 6 M. Laidlaw



thatch grass (*Hyparrhenia rufa* subsp. *rufa*)

Not declared

Family: Poaceae

Origins

Thatch grass is a perennial tussock grass native to Africa. It was introduced to the Northern Territory as a potential pasture species for grazing, silage and hay production. Thatch grass has now become widely naturalised in the coastal areas of the Northern Territory and is commonly found in the northern, central and south eastern areas of Queensland, occurring in grasslands, savannas, dry forests and open woodlands. Thatch grass is not declared but is an invasive weed in Queensland.

Figure 1 K. McDonald

Known invasion pathways

Roadsides and disturbed areas are amongst the common sites for this opportunistic grass to establish, as vehicles, farm machinery, slashers and road graders are all mechanisms for spread. Seed can be found as a contaminant of fodder, mulch and pasture seed. Seeds can also be dispersed via wind. The long awns or bristles on the thatch grass seed can also be spread by attaching to clothing or animal fur.

Fig. 2 K. McDonald

Description

Thatch grass is an erect, densely tufted perennial or occasionally annual grass 1–2.5 m tall (fig.1). The leaves are usually hairless, flat, 2–8 mm wide and 30–60 cm long with rough margins. Stems are smooth and hairless with the flower head 20–40 cm long (fig. 2). Flower stalks are forked (fig. 3) with each branch of the fork growing to about 4 cm long. The flowers are covered in rusty brown hairs.

The red-brown seeds are twisted, sparsely covered with stiff hairs and have an awn or bristle about 2 cm long that is bent in two places along its length. The tall seed heads form from February.

Impacts


Fig. 3 S. Navie

Thatch grass is highly tolerant to drought, grazing and fire and can become dominant following fires, especially in grasslands and woodlands. Its aggressive growth and habit, along with high seed viability allows for thatch grass to outcompete and replace native grass species, dominating understorey vegetation and threatening native biodiversity. Thatch grass grows in tall dense stands, often forming monocultures resulting in high fuel loads. This can lead to increased fire intensity and frequency in infested areas. Following a fire, thatch grass can grow to out-compete native grasses for water and nutrient resources due to its high germination potential and rapid seedling growth. As such, thatch grass poses a significant threat to biodiversity. This altered fire cycle can eventually lead to the destruction and loss of native savannas and woodlands and their eventual replacement by thatch grass.

Useful links

Biosecurity Queensland
https://www.daf.qld.gov.au/biosecurity

Weed Spotters Network Queensland
www.qld.gov.au/environment/plants-animals/plants/herbarium/weed-spotters/

AgForce Queensland
https://agforceqld.org.au/

Plant identification

Queensland Herbarium
www.qld.gov.au/environment/plants-animals/plants/herbarium/

Weed identification tool
https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/identification

Seed identification tool
www.graintrade.org.au/sites/default/files/file/Publications/Seed%20Impurities%20of%20Grain%20an%20identification%20kit%20(1).pdf

DAF weed fact sheets
www.business.qld.gov.au/industry/agriculture/species/invasive-plants/other

Keybase online keys
http://keybase.rbg.vic.gov.au/

Farm Biosecurity

Create your own farm biosecurity plan
www.farmbiosecurity.com.au/toolkit/update-your-farm-biosecurity-profile/

Farm biosecurity toolkit
http://www.farmbiosecurity.com.au/toolkit/

Farm biosecurity records
http://www.farmbiosecurity.com.au/toolkit/records/

Weed management and control

DAF weed fact sheets
www.business.qld.gov.au/industry/agriculture/species/invasive-plants/other

Appendix A - Botanical specimen cover sheet

QUEENSLAND GOVERNMENT

Botanical specimens – cover sheet

Botanical Specimens for Identification
Complete this form (one for **each** specimen) & send with specimen/s to:

Botanical Information and Advisory Service
Queensland Herbarium, DSITI
Brisbane Botanic Gardens Mt Coot-tha
Mt Coot-tha Road, TOOWONG QLD 4066
Queensland.Herbarium@qld.gov.au

Office Use Only

Date received .....
Identification no. .....
Date of despatch .....

Name:

Company / Department:

Postal Address

Postcode

Telephone: **Fax**:

Email:

Please send results by: ☐ post ☐ email ☐ fax ☐ telephone

Purpose: ☐ weed detection ☐ poisonous ☐ conservation ☐ commercial

Additional information required:

Label Information: Specimens sent to the Herbarium for identification are frequently retained in the collection for scientific, distribution and voucher records. The label information below when accompanying **each** specimen aids the identification process and greatly increases the scientific value of your specimen.

Collector's Name & No.: **Date of collection** / /

Botanical name (if known)

Locality (include road name &/or distance & direction from nearest town):

Coordinates:
Latitude: °**S** **Longitude:** °**E**

(DD MM SS.SSSS – seconds preferred but not compulsory. Please don't supply decimal degrees or decimal minutes)

Or **MGA** / **AMG Coordinates:**	**DATUM**: GDA94/WGS84 *or* AGD84 (circle)	**Zone:**	**Easting:**	**Northing:**

Or **Map** (e.g. 9442) **and grid reference** (eg 333 666)	**Map number**:	**Grid reference**:

Source of Coordinates: ☐ GPS ☐ Map ☐ Gazetteer ☐ Other

Situation (e.g. plain, creek bank, mountain)

Cultivated? ☐ YES ☐ NO

Vegetation type (e.g. forest, heath, woodland)

Soil / geology / regional ecosystem:

Kind of plant (e.g. tree, vine, herb): .....

Description (e.g. height, flower or fruit colour: .....

Abundance: ☐ number of individuals ☐ number seedlings/ juveniles ☐ ha/m^2 size of clump

Other Notes

Specimens submitted automatically become the property of the Queensland Herbarium

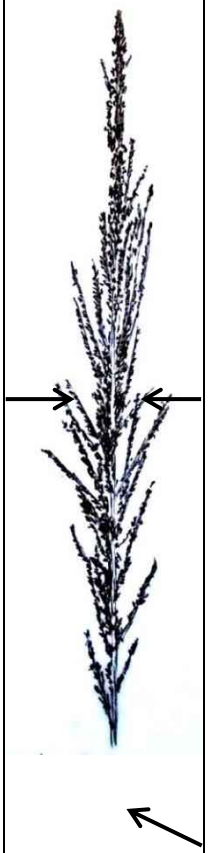
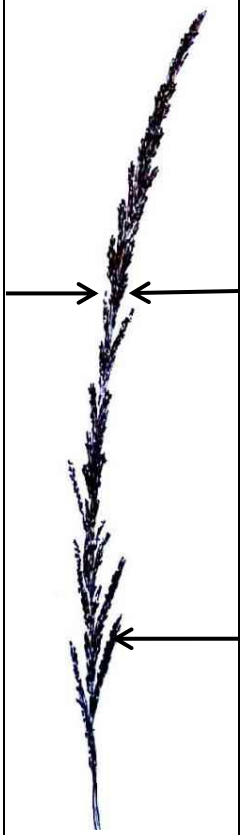
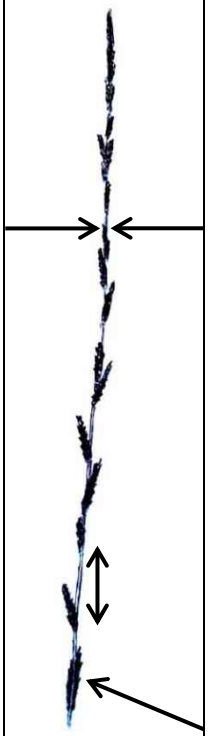
For more information phone (07) 3896 9326 or email Queensland.Herbarium@qld.gov.au

Appendix B: A guide to rat's tail grasses and allied *Sporobolus* species in Queensland

Identification of the rat's tail grasses (*Sporobolus* species that have rat's tail-like inflorescences) and allies can be very difficult due mostly to environmental influences (see notes on page 4). For this reason, it is only possible to provide a guide to identifying them in the field. Microscopic examination in the laboratory is usually required to confirm identifications.

To help with field identification, **mature seed heads** of these *Sporobolus* species have been divided into three groups as shown in the key and diagrams below. Keys to the species within the groups are also provided below.

Seed heads that are still green are mature when seeds are visible and at least some seeds can be easily stripped off by running the seed head between two fingers. The seed heads in this group of plants mature from the top down. Older seed heads turn pale and fragment especially in the upper 1/3.

Group 1: giant rat's tail grasses (declared Class 2) and similar species	Group 2: Parramatta grasses (declared class 2) and similar species	Group 3: slender rat's tail grasses (all native)
		
Seed head at 1/3 from apex: • >5 mm wide • main axis mostly obscured • branches lying flat against axis to lightly spreading • branches to about 4 cm long **Branches at base:** • usually slightly to strong spreading • <10 cm long and 1–2 mm wide • branch axis obscured at base • rod shaped • spikelets usually spaced or with spaced clusters	**Seed head at 1/3 from apex:** • mostly 3–4 mm wide • main axis mostly obscured • branches flat against axis. • branches < 1 cm long **Branches at base:** • lying flat against the main axis to lightly spreading • mostly less than 4 cm long and 2–3 mm wide • main axis usually obscured at base but sometimes branches well-spaced • rod shaped • spikelets mostly closely packed	**Seed head at 1/3 from apex:** • less than 3 mm wide • main axis usually partly visible • branches < 1 cm long **internode:** space between two nearest branch joints along the main stem axis **Branches at base:** • usually lying flat against the main axis • < 6 cm long and usually 3–4 mm wide • main axis clearly visible • usually cone shaped • spikelets usually closely packed

Key to groups

Note that only *Sporobolus* species that have rat's tail inflorescences are included in the keys

1. Seed head at 2/3 point usually > 3 mm wide#1, branches spreading or lying flat along main axis, branches usually so crowded as to obscure main axis; lowest branches usually < 3 mm wide and cylinder shaped ..... go to **2**

1: Seed head at 2/3 point < 3 mm wide#1 branches usually lying flat; main axis usually only partially obscured by branches; lowest branches often > 3 mm wide at base and cone shaped

..... **Group 3**

2. Seed head at 2/3 point > 5 mm wide#1 and usually spreading at maturity; lowest branches usually 1–2 mm wide (except S. sessilis which are often 2–3 mm wide)..... **Group 1**

2: Seed head at 2/3 point 3–4 mm wide#1 and mostly lying flat along main axis; lowest branches usually 2–3 mm wide ..... **Group 2**

#1 seed heads must be mature but not over mature. Old disintegrating heads or very young heads may not key accurately. (See below)

Group 1: giant rat's tail grasses (declared class 2) and similar species

1. Upper glume apex acute and c. 1/2 spikelet length..... ***S. natalensis*** (giant rat's tail grass) #2

1: Upper glume apex obtuse usually ragged apex and c. 1/3 spikelet length) …….go to **2**

2. Mature plants usually less than 70 cm tall ……***S. jacquemontii*** (American rat's tail grass)

2: Mature plants usually more than 70 cm tall……..***S. pyramidalis*** (giant rat's tail grass) #2

#2 Microscopic examination of seed heads required to distinguish between these species, and even then you need good material (see notes below). If you are not sure, then a result of

"*S. *natalensis*—*S. pyramidalis* complex (giant rat's tail grass)" is acceptable.

These species can be found in habitats ranging from grazed bushland to highly disturbed areas.

* Declared Class 2 pest under *the Land Protection (Pest and Stock Route Management) Act 2002*

Group 2: Parramatta grasses (declared Class 2) and similar species

1. Branches partially obscuring main axis and appearing to be in clusters or whorls or 2 or 3; branches c. 1.5 cm long at the 2/3 point (habitat is usually black clay soil plains)

.....***S. disjunctus*** #3 (a native species)

1: Branches obscuring main axis for most of length; branches < 1 cm long at 2/3 point

(not usually occurring on black soil plains) …… go to **2**

2. Lowest branches usually < 2 cm long; spikelets > 2.1 mm

……*__S. africanus__* (Parramatta grass)

2: Lowest branches usually > 2 cm long; spikelets < 2.1 mm

.....*__S. fertilis__* (giant Parramatta grass)

Note: when the seed heads of these Parramatta grass species are immature, the lowest branches may not have reached full length as they continue to grow after the apex of the inflorescence has stopped growing. Put more reliance on the spikelet length. Even so, if the inflorescence is immature your determination should be recorded as "probably. …" or "*S. africanus—S. fertilis* complex (Parramatta grass)"

#3 *Thellungia advena* has a very similar looking inflorescence but usually has 3–5 florets /spikelet and is likewise found on heavy clay soils.

Eragrostis megalosperma and *Eragrostis curvula* have occasionally been mistaken for rat's tail grasses when seed heads are immature but differ by the spikelets having 5 or more florets. Also, *Eragrostis megalosperma* has wiry branched stems retaining the leaf sheaths at the nodes.

* Declared Class 2 pest under *the Land Protection (Pest and Stock Route Management) Act 2002*

Group 3: slender rat's tail grasses (all native)

1. Lowest seed head branches shorter than the internode.. ***S. creber*** (slender rat's tail grass)

1: Lowest seed head branches as long as or longer than the internode

..... ***S. elongatus*** (slender rat's tail grass)

Both species are native and are usually found in lightly grazed bush land.

Collection of specimens

When collecting specimens of these Sporobolus species it is necessary to ensure the following:

Whole portions of plants are collected i.e. root stock and seed head intact.

Two or three specimens are collected, not just the smallest or largest.

If possible at least one of the specimens should have an **intact mature seed head**. Over-mature and immature seed heads are sometimes difficult to identify to the three groups.

Take notes on **maximum height of plants** and provide some guide to population size.

Include **habitat location and description** e.g. mowed edge of road with sandy clay soil 2 km west of Bundaberg; undisturbed ironbark woodland on hilly terrain with sandy loam soil 70 km NW of Townsville. The degree of disturbance of the habitat can provide useful additional information about whether the species of *Sporobolus* covered in this guide are native (group 3) or introduced (groups 1 & 2). The native species have slender culms and tend to occur in undisturbed habitats. Slender culms is not a diagnostic character for the native species as the introduced species share this state when young or suppressed in shade or harsh conditions.

Important information

The characteristics of the seed heads of some specimens of these grasses can overlap the groups. This can be attributed to the effect of the following factors:

Habitat condition: soil fertility; shaded habitat; soil moisture regime; grazing or mowing – poor conditions can cause the seed heads to be stunted. The influence of these environmental factors can vary with the species.

Maturity of seed heads: immature seed heads can be incorrectly classified into one of the 3 Groups because the branches may not have fully developed or the seed heads may be too old for accurate measurements.

Time of year: seed heads can have smaller dimensions during winter.

Disease: can cause seed heads to be stunted.

Natural variation within a population: some populations of plants may have a broad degree of natural variation in the seed heads.

Note that sometimes there can be **more than one species** of *Sporobolus* at a site.

If in doubt about identification, send a specimen, or contact us at:

Queensland Herbarium
Brisbane Botanic Gardens Mt Coot-tha
Mt Coot-tha Rd
Toowong QLD 4066 AUSTRALIA
Tel: (07) 3896 9318 fax: (07) 3896 9624 email: Queensland.Herbarium@qld.gov.au