

Weedy *Sporobolus* grasses



A dense infestation of giant rat's tail grass in coastal Queensland. Photo: DEEDI image library.

Key points

- Weedy *Sporobolus* grasses (WSG) grow quickly, flower and set seed whenever the pasture becomes less competitive as a result of drought, overgrazing, fire or mechanical disturbance.
- Seed production is high with large seed banks developing. Most of the seed that falls from the head is viable and can remain so for up to 10 years.
- Pay close attention to property hygiene. WSG seeds (particularly when wet) are easily spread by stock, vehicles and machinery.
- Good management is based on best practice grazing land management principles: managing ground cover, spelling pastures, avoiding overgrazing and remaining vigilant.

The problem

Weedy *Sporobolus* grasses (WSG) are a group of exotic weeds that include giant rat's tail grass (*Sporobolus pyramidalis* and *S. natalensis*), American rat's tail grass (*S. jacquemontii*), giant Parramatta grass (*S. fertilis*) and Parramatta grass (*S. africanus*).

These weeds are extremely invasive and difficult to distinguish from other pasture grasses. The majority were introduced accidentally and have spread to large areas of eastern Australia as contaminants in pasture seed.

WSG produce large quantities of easily dispersed seed that rapidly develop into extensive and long-lived seed

banks. They are highly competitive and have long-term impacts on pasture productivity and natural ecosystems.

Mature leaf blades are tough and difficult to graze, leading to reduced feed intake. Consequently, cattle grazing WSG dominated pastures can take up to 12 months longer to reach equivalent weights, and stocking rates need to be halved to maintain normal levels of production per animal. Current infestations are estimated to cost the pastoral industry in the vicinity of \$60 million per year in lost production and control costs.

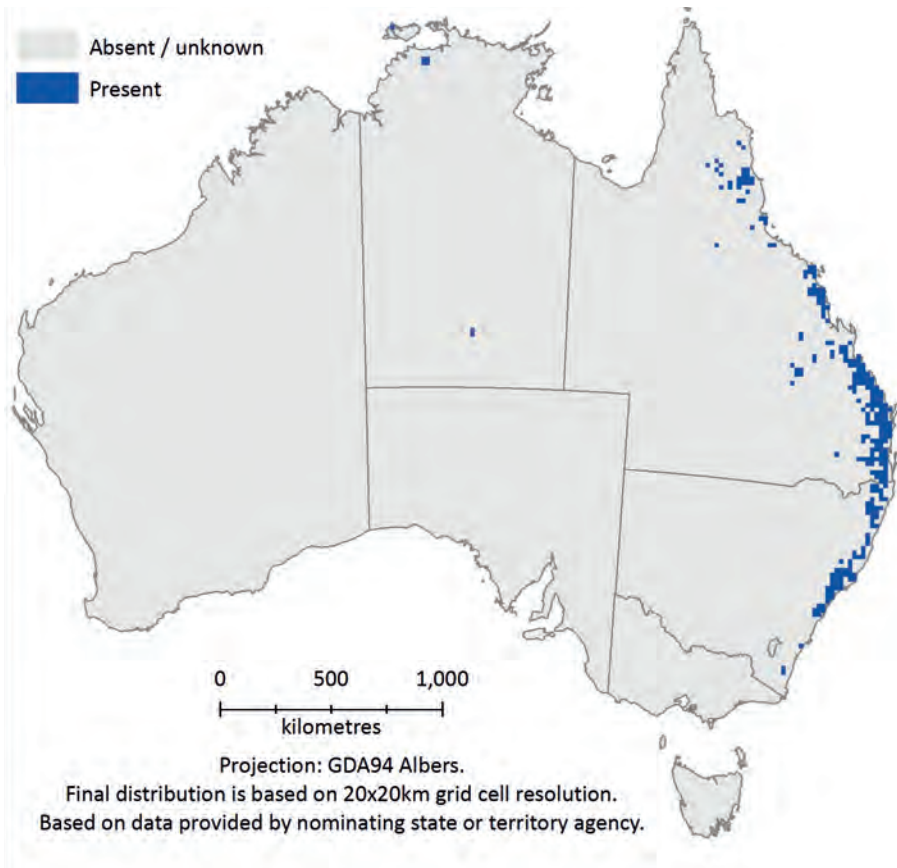
The weed

Weedy *Sporobolus* grasses (WSG) are robust, tufted, well-rooted perennial tussocks. They grow up to 2 m tall and are extremely tolerant of environmental stresses and grazing pressure.

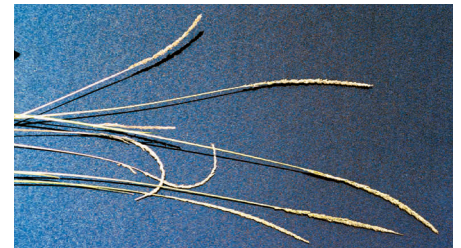
WSG originate from a range of countries including Asia, Africa, south-eastern America, Columbia and Brazil. They can reach maturity very rapidly and will dominate whenever the pasture becomes less competitive through drought, overgrazing, fire or mechanical disturbance.

WSG are adapted to a wide range of soils and climatic conditions and have the potential to establish in areas receiving as little as 500 mm of annual rainfall. This means that more than 30% of Australia (223 million ha) is prone to invasion.

Map 1: Current (2011) distribution of giant rat's tail grass (*Sporobolus pyramidalis*) in Australia.



Giant Parramatta grass infestation. Photo: David Officer, NSW DPI.



Parramatta grass seed heads. Photo: David Officer, NSW DPI.

How to identify

Giant rat's tail grasses (*Sporobolus pyramidalis* and *S. natalensis*) commonly grow to 1.7 m tall when seeding. The seed heads form a 'rat's tail' spike when young, but may branch to an elongated pyramidal shape when mature. The seed head can range from 25 to 80 cm long and the side branches from 3 to 8 cm long.

American rat's tail grass (*Sporobolus jacquemontii*) looks like a short version of giant rat's tail grass, growing to 1 m tall.

Giant Parramatta grass (*Sporobolus fertilis*) grows up to 1.6 m tall when seeding and the seed heads maintain the 'rat's tail' appearance into maturity. Sooty spike disease sometimes develops on its seed heads.

Parramatta grass (*Sporobolus africanus*) is similar to giant Parramatta grass, but only grows to 1.1 m tall.



Giant rat's tail grass seed head. Photo: Steven Bray, DAFF.



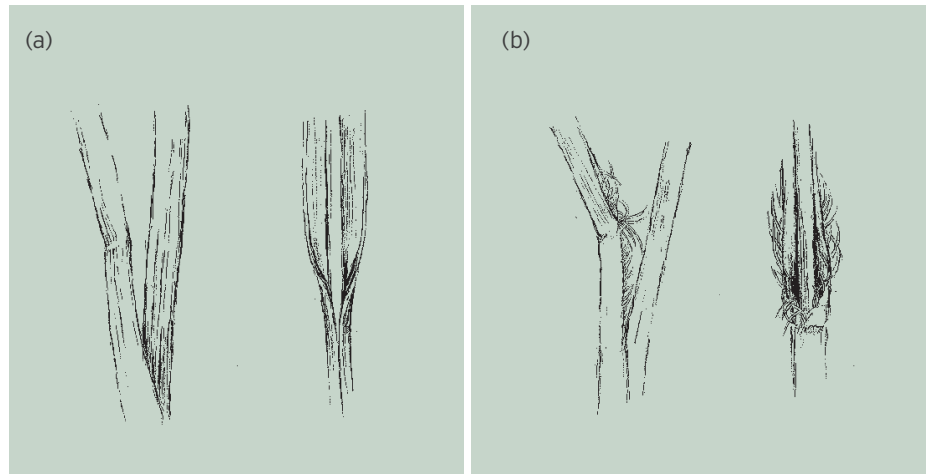
Giant rat's tail grass plant. Photo: Steven Bray, DAFF.

Similar species

There are a number of Australian *Sporobolus* species that pose no agricultural threat and which play an important role in our native ecosystems.

Native *Sporobolus* species are similar in appearance to WSG; however, they usually have obvious hairs on the leaf margins between the leaf blade and leaf sheath.

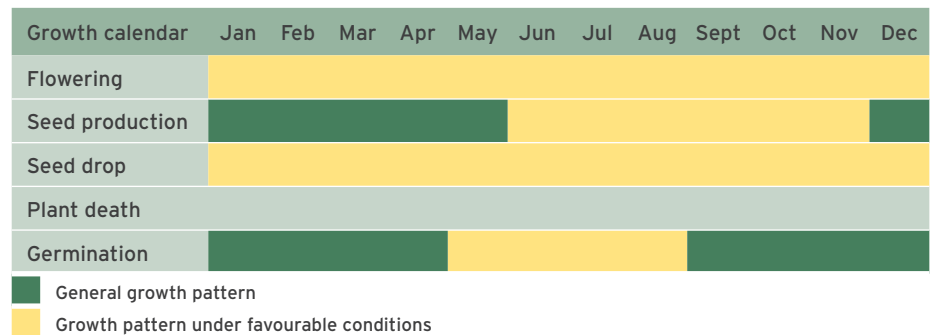
Native *Sporobolus* grasses also tend to be shorter than WSG, their seed heads are often less dense, and their leaves are not as tough. Positive identification of small plants within a pasture is difficult until they produce a seed head.



(a) WSG species with hairless leaf margins and (b) native *Sporobolus* species with obvious hairs. Illustrations: Mandy Yee.

Growth calendar

Under the right conditions (rain, available soil moisture, soil and air temperature) WSG can mature and set seed within three months of emergence and at any time of the year. However, the majority of seed is produced during the spring and summer months. Mature WSG are long lived (more than 10 years), and resistant to competition from the surrounding pasture.



How it spreads

WSG infestations produce between 2000 seeds/m² per year in light infestations and up to 80 000 seeds/m² per year in highly infested areas. As a consequence, soil seed banks develop quickly.

WSG seeds become sticky when wet, easily attaching to the coats of animals and lodging on vehicles and machinery. The seeds also survive the digestive system of animals and can be spread in manure. It is estimated that livestock can transport up to 30 000 viable seeds/beast/day and land managers should always assume that vehicles, animals and persons passing through WSG infested paddocks have been contaminated with seed.



WSG seed and seed heads may easily be spread by vehicle. Photo: Steven Bray, DAFF.

Where it grows

WSG infests an estimated 450 000 ha of grazing land in eastern Queensland and New South Wales, posing a serious threat to the viability of many rural industries. The most significant infestations extend from the Queensland-New South Wales border, north to Mackay, Townsville, Ingham and Mareeba. Significant infestations also occur in the north coast region of New South Wales with smaller areas found south to the Victorian border.

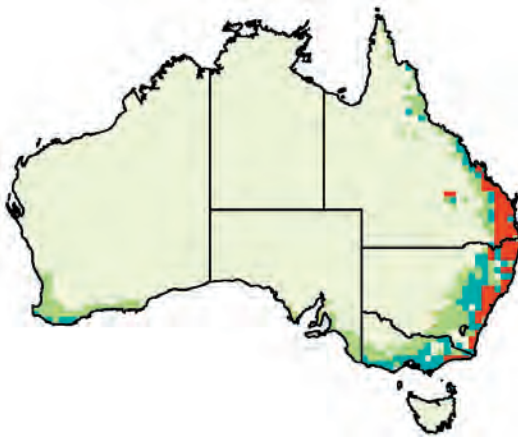
Potential distribution

Potential distribution modelling has been undertaken for each of the five WSG species (*S. pyramidalis* and *S. natalensis* are grouped under giant rat's tail grass). Predicted ranges vary but these maps indicate that the only state that will not be vulnerable to some level of invasion is Tasmania.

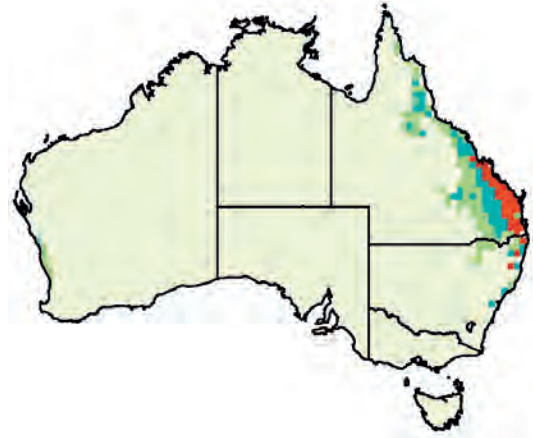
Queensland is most at risk, with more than 108 million ha (60%) prone to infestation. Australia-wide, WSG have the potential to invade 223 million ha (30% of the country).

Map 2: Future potential distribution of WSG in Australia. Steven Bray, DAFF.

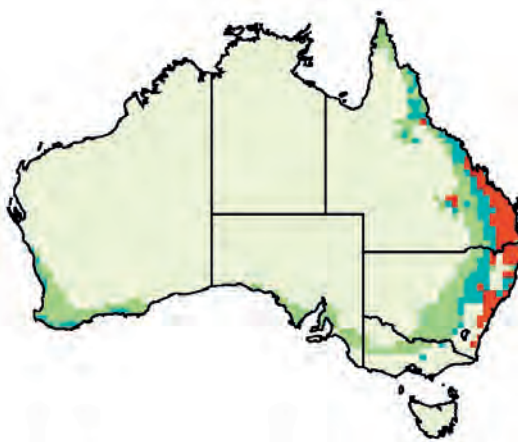
Parramatta grass (*Sporobolus africanus*)



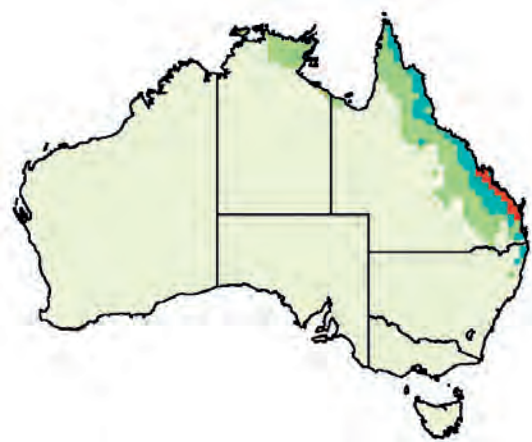
Giant rat's tail grass (species 2) (*S. natalensis*)



Giant Parramatta grass (*S. fertilis*)



Giant rat's tail grass (species 1) (*S. pyramidalis*) and American rat's tail grass (*S. jaquemontii*)



Climate suitability



What to do about it

Prevent WSG spread

Preventing the spread of WSG seed into clean land is the most effective action you can take to stop the infestation cycle. Having effective property hygiene practices in place will assist in minimising the risk of spread.

Develop a 'come clean, go clean' approach to the management of WSG. Check vehicles and machinery entering your property to ensure they are clean. Restrict vehicle movement to clean areas and tracks, and avoid WSG areas in wet weather. Work in clean areas first before moving to infested areas and make sure vehicles are cleaned before leaving infested sites.

Native and feral animal movement also pose a WSG spread risk. Strategies include initiating control programs for feral animals and where possible, fencing off key areas such as watercourses and dams. Watercourses in good condition are likely to filter seed out of the water flow.

To prevent seed movement by stock, spell animals for at least five days in yards before releasing them into well monitored paddocks. Stock purchased from known or suspected infested areas should always be spelled in the yards as a precaution. Also ensure stock are moved when there is no dew or rain as this will decrease the amount of seed sticking to their coats.

Regular monitoring of the entire property is required to identify and control any isolated WSG. It is also wise to establish buffer strips on boundaries, laneways and roads/tracks as an effective barrier to wind blown seed.

The seeds of *Sporobolus* grasses (weedy and native) are indistinguishable in pasture seed samples. Therefore, only purchase seed from reputable seed merchants and check that the seed analysis report does not include any *Sporobolus* spp.

Determine the origin of any hay introduced to the property and treat as suspicious anything from a known WSG area. If uncertain, feed hay in



Healthy, competitive pastures will help prevent WSG establishment. Photo: Steven Bray, DAFF.

a designated yard, feedlot or small holding paddock so monitoring and management of a potential WSG outbreak is possible.

Management

Effective planning to manage WSG should include the following elements:

- Identify and map all areas of infestation.
- Protect clean country.
- Prioritise work - initiate control programs in areas of light infestation and work towards the denser infestations.

WSG seedling emergence is stimulated by fluctuations in temperature and exposure to light; therefore it is important to maintain healthy, competitive pastures. Effective WSG management is dependent on implementing the principles of best practice grazing land management:

- Manage ground cover - avoid disturbing areas and exposing bare ground. This is essential to provide sufficient competition and reduce germination of WSG seed.
- Spell pasture - continuous grazing weakens plants and reduces their competitiveness. Pasture plants require periodic rest to build-up reserves and produce seed.

- Avoid heavy grazing - this may actually favour WSG spread as it weakens a pasture's competitive ability and its resistance to weed invasion. Therefore it is important to match forage production with animal consumption.
- Remain vigilant - keep a look out for isolated WSG and implement control before they become established.

Control strategies

Various control strategies exist and implementation needs to be considered based on the degree of WSG infestation. Outlined below are six main categories of infestation and their various control approaches.

1. Occasional plants only (100 plants/ha or 1 plant/100m²) or less

- Regularly look for WSG plants.
- Chip out isolated WSG (causing minimal soil disturbance), bag and burn; or
- Spot spray with flupropanate* or glyphosate herbicide.
- Consider spraying the selective herbicide flupropanate* in a 2 m buffer around removed plants to control seedlings.

2. Scattered plants and/or small clumps (up to 1000-2000 plants/ha or 1-2 plants/10 m²) on land accessible to machinery

- Spot spray isolated plants before progressing to heavier infestations.
- In infestations of more than 1000 plants/ha, use broadacre application methods such as wick wiping of glyphosate or boom spraying with flupropanate*.

3. Scattered plants and/or small clumps (up to 1000-2000 plants/ha or 1-2 plants/10 m²) on land not accessible to machinery

- Spot spray isolated plants before progressing to heavier infestations.
- Aerial application of flupropanate[†] if good pasture species are still present.

4. Dense infestations on arable land (more than 2000 plants/ha or 2 plants/10 m²)

Marginally arable land with poor pasture species composition:

- Consider planting a fodder crop (e.g. forage sorghum) before replacing pasture; or
- Direct pasture replacement using minimum tillage techniques to avoid bringing WSG seed to the surface.
- In both instances, first boom spray WSG with glyphosate at 4 L/ha to kill plants and spot spray WSG on headlands.

Marginally arable and arable land with desirable pasture species present:

- Broadacre application of flupropanate*.

Arable land with poor pasture species composition:

- Consider planting grain or oilseed crops to provide greater flexibility in choice of pre- and post-emergent herbicides; and the cost-benefit of a cash crop.
- Prior to planting, boom spray WSG with glyphosate at 4 L/ha to kill plants and spot spray WSG on headlands. Between annual cropping cycles, spray with glyphosate at 1-2 L/ha to control WSG seedlings.



Burning may reduce the WSG soil seed bank but does not control mature plants. Photo: Steven Bray, DAFF.

- Pasture may be re-established using minimum tillage techniques in the third summer.

5. Dense infestations on non-arable land accessible to machinery (more than 2000 plants/ha or 2 plants/10 m²)

- Broadacre application of flupropanate* or wick wiping with glyphosate if good pasture species are still present.

- Direct pasture replacement if no competitive pasture species are present.

6. Dense infestations on land not accessible to machinery (more than 2000 plants/ha or 2 plants/10 m²)

- Aerial application of flupropanate[†] if good pasture species are still present; or
- Fence off and isolate area because of the high cost-low benefit of other options.

- Spot spray fence lines and tracks to isolate the infested paddock.

* Subject to label and permit conditions - there may be differences between the states in recommended flupropanate application methods, species targeted and timing of application. When using herbicides always read the label and follow instructions carefully. Also be aware that there is a 14 day withholding period for stock after spot spraying with flupropanate and this herbicide cannot be used where lactating dairy cows and goats are grazing.

[†] A permit from the APVMA is required for aerial application of flupropanate on WSG: www.apvma.gov.au.

Mechanical control

Slashing is not recommended as a stand-alone management technique for WSG as it tends to promote seed production and the machinery can be a major seed transport mechanism. However, slashing can be an important tool for removing dead growth and establishing consistent height WSG for the implementation of wick wiping techniques. If slashing is used, check and clean machinery prior to movement to another area.

Fire

Burning rarely kills mature WSG infestations, but can reduce the soil seed bank by up to 50%. Care must be taken though, as increased grazing pressure or herbicide use post-fire may reduce competition levels and lead to the development of denser WSG infestations. Fire may also be used to structure the WSG stand prior to wick wiping.

Biological control

A local fungus (*Nigrospora oryzae*) has been identified as a potential agent for giant Parramatta grass. In the Clarence Valley of New South Wales this fungus has produced crown rot symptoms that have significantly reduced the severity of infestations over the last 10 years. A near 80% reduction in tussock size has been recorded over 15 months and in natural infections the fungus has often reduced the level of infestation to a point where it no longer effects animal production.

In mid 2011 the fungus was also identified in giant rat's tail grass infestations from central Queensland to the mid-north coast of New South Wales. At this stage the impacts on this species are unknown; however, research is underway to examine the potential of the fungus as a commercial biological control agent.

Registered herbicides for WSG

Registration requirements may differ between the states. For further information, contact your state or territory management agency or go to www.apvma.gov.au.

In pasture situations, the most commonly used herbicide for broadacre application is flupropanate, which is a selective and residual herbicide. Glyphosate, a non-selective and non-residual herbicide, is also used as a primary treatment to enable complete pasture re-establishment; or using selective application techniques such as spot spraying or wick wiping.

Legislation

In Queensland, WSG are Class 2 weeds. Landowners must take reasonable steps to keep their land free of giant rat's tail grass (*S. pyramidalis* and *S. natalensis*), American rat's tail grass (*S. jacquemontii*), giant Parramatta grass (*S. fertilis*) and Parramatta grass (*S. africanus*) and it is a serious offence to introduce, keep or supply these weeds without a permit. In addition, a person is required by law to provide written notice (Weed Hygiene Declaration) if the products they are selling, giving or supplying are, or could be, contaminated with WSG.

In New South Wales, WSG have been declared noxious in some areas. Giant rat's tail grass (*S. pyramidalis* only) is considered a Class 3 weed in areas where it is found, and must by law be fully and continuously suppressed and destroyed. Giant Parramatta grass (*S. fertilis*) has been declared in some areas as a Class 3 pest and in others as a Class 4 pest. By law, the growth and spread of Class 4 pests must be controlled according to measures set out by the local control authority.

Weed control contacts

Contact the weed control authority in your state for up to date information on pesticides and legislation.

State / Territory	Department	Phone	Email	Website
National	Australian Pesticides and Veterinary Medicines Authority	02 6210 4701	contact@apvma.gov.au	www.apvma.gov.au
ACT	Department of the Environment, Climate Change, Energy and Water	13 22 81	environment@act.gov.au	www.environment.act.gov.au/environment
NSW	Department of Primary Industries	1800 680 244	weeds@dpi.nsw.gov.au	www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds
NT	Department of Land Resource Management	08 8999 4567	weedinfo@nt.gov.au	www.lrm.nt.gov.au/weeds
Qld	Department of Agriculture, Fisheries and Forestry	13 25 23	callweb@daff.qld.gov.au	www.daff.qld.gov.au
SA	Biosecurity SA, Dept of Primary Industries and Regions SA	08 8303 9620	nrm-biosecurity@sa.gov.au	www.pir.sa.gov.au/biosecuritysa/nrm-biosecurity/weeds
Tas	Department of Primary Industries, Parks, Water and Environment	1300 368 550	See contacts at www.dpipwe.tas.gov.au/weeds	www.dpipwe.tas.gov.au/weeds
Vic	Department of Environment and Primary Industries	13 61 86	customer.service@dpi.vic.gov.au	www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds
WA	Department of Agriculture and Food	08 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au

Case study: Controlling giant rat's tail grass at Gargett

Rod Watt, a cane grower and cattle producer from Gargett, 50 km west of Mackay, has been managing giant rat's tail grass (GRT) on his property since 1996. When purchased, 95% of the property was infested with GRT and, after putting some of it under sugarcane, he was left with approximately 100 acres to manage.

Despite dealing with multiple cyclones, floods and lengthy wet seasons which spread the seed and restricted management options, after 5-6 years of work, the GRT infestation on the property is just about under control. Rod concedes that management will have to be on-going, but it has reached an easily sustainable level.

Initial control work was done using a wick wiper with mixed results. Glyphosate effectively killed the adult plants, but left a large and long-lived seed bank that continued to germinate. To exhaust the seed bank and bring his property under control more rapidly, Rod implemented a couple of strategies.

Option 1

In relatively clean areas, he maintained good grass cover by keeping stocking rates low, spot spraying GRT when it appeared and cultivating grasses like Tully humidicola, Rhodes grass and African star grass, which grow well in the local area.

Option 2

- Boom spray with residual herbicide (flupropanate);
- Cultivate and replant with favourable grasses prior to GRT recovery and reseeding; or fertilize the pasture to encourage favourable regrowth; and
- Spot spray isolated GRT when it re-appears.



GRT infested paddock following spot spraying, Gargett, Queensland. Photo: R. Watts.

Option 3

- Work the ground or use flupropanate to kill GRT seeds (as they attempt to germinate);
- Use glyphosate to kill everything else; then
- Re-sow with desirable pasture.

Because giant rat's tail grass seeds so readily during the wet season, Rod matched his use of flupropanate and glyphosate to the conditions. A combination of glyphosate and flupropanate (sprayed separately) was used during the wet season because glyphosate immediately halted seed production, while flupropanate (which takes longer to kill the plants) provided the residual benefits. During the dry season, flupropanate alone could be used.

The maintenance of good weed hygiene practices were also critical to Rod's success.

Acknowledgements

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Technical input: Steven Bray, Biosecurity Queensland, DEEDI and David Officer, NSW Department of Primary Industries.

Maps: Data provided by state and territory weed agencies. Potential distribution modelling by Steven Bray, Queensland DAFF.

Key references

Biosecurity Queensland (2011). Giant rat's tail grass and other weedy *Sporobolus* species - Fact Sheet.

Department of Primary Industries and Fisheries (2007). Weedy *Sporobolus* grasses - Best Practice Manual. Department of Primary Industries and Fisheries, Brisbane, Queensland.