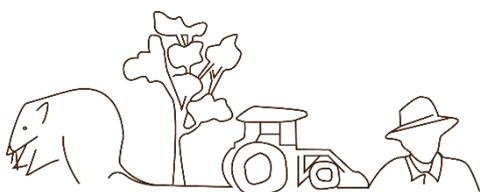


Cotton Bush

Weed Management Plan

For your Property



Peel-Harvey Biosecurity Group

...Protecting our agricultural and natural environment



Department of
Agriculture and Food



Developing an integrated weed management (IWM) plan

Integrated weed management (IWM) is a system for managing weeds over the long term, and is particularly useful for managing and minimising herbicide resistance. An integrated weed management plan should be developed for each paddock or management zone based on five steps: review past actions; assess the current weed status; identify weed management opportunities within the property and match the weeds to the most suitable control technique.

IWM plan development

An integrated weed management plan should be developed for each paddock or management zone based on five steps.

1. Map your property.
2. Identify the weeds on your property
3. Review past actions. The history of herbicide use can be used to prioritise weed management tactics to avoid the use of high risk herbicide mode-of-action groups and identify those paddocks at risk.
4. Identify weed management opportunities within the property. Ensure that the proposed changes to the weed management system are suited to the land; infrastructure, resources and the tactics are environmentally and economically sound.
5. Match the weeds to the most suitable control technique.
6. Prevent weed seed introduction

In a well-integrated weed management plan, each target weed will be attacked using the most suitable method that is the least toxic to people, livestock and the environment.

Each technique provides a key opportunity for weed control and is dependent on the management objectives and the target weed's stage of growth.

Successful weed management also relies on the implementation of the best pasture and crop management to reduce the opportunity for weeds to become established.

i.e. a healthy pasture is resistant to weed invasion by having a balance between pasture, soil nutrition and grazing or pasture management that does not allow weeds to establish.

<https://www.agric.wa.gov.au/grains-research-development/developing-integrated-weed-management-iwm-plan>

1. Map your Property

Map of property- Draw a basic outline of your property boundary with any distinguishing features e.g. house, sheds dams. You may want to note any surrounding infestations on neighbouring properties

Then draw in the extent of the Cotton Bush infestation and indicate if these areas are a

-  Light infestation = few scattered plants
-  Medium Infestation = Plants in clumps and plants are more than 5m apart
-  Heavy Infestation = Plants in clumps and plants less than 2m apart
-  Extremely Heavy Infestation – Plants less than 50cm apart

X Photo points

Property Address _____

2. Identify the weeds on your property

Under the *Biosecurity and Agriculture Management Act 2007* landholders must take control measures to destroy, prevent or eradicate declared pests.

To assist landholders to control the majority of declared weed species commonly found in the South West region, the Department of Agriculture and Food, Western Australia has compiled a declared plant management calendar.

Cape Tulip



Narrow Leaf Cotton Bush



Apple of Sodom



Variegated Thistle



Arum lily



Calendar for managing declared plants in the South West region

Weeds	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Apple of Sodom	◆	◆	◆	√	√	√	+	+	+	√	√	√
Arum lily						√	√	√	√	√	√	
Blackberry	√	√	√	+								√
Cape tulip							√	√	√			
Cotton bush*	◆	◆	◆						√	√	√	√
Doublegee*				√	√	√	√	+				
Paterson's curse				√	√	√	√	√	+			
Variegated thistle*				√	√	√	√	√	+			

Key

√ Optimum spraying time - maximum control achieved

◆ Spraying recommended only after summer rains have fallen

+ Spraying can be carried out. Satisfactory control will be achieved using higher rates of herbicide.

* Multiple germinations during the growing season - may require more than one treatment.

Cotton Bush Timing and methods of control

Season	Cotton Bush Activity	Physical control Methods	Chemical Control Notes	Pasture area Chemical Alternative	Sensitive area Chemical Alternative	Follow Up Monitoring
Summer	Cotton Bush is actively growing, Germination Occurs ,Flowers forming, Germination	Hand pull out germinating seedlings,	Spray with chemical control when plants actively growing. Glyphosate (Group M) (various trade names: see APVMA link) 1:100 for 360 g/L formulation. Where low volume/low pressure pumps are being used the rates should double. The addition of 10g of metsulfuron/100L of water has also given improved control.	Triclopyr (sold under various trade names) Use crop-oil such as Uptake® @ 500 mL 100 L, or DC-Trate @ 1 L / 100 L	Use Roundup® Biactive™ or Razor™ around sensitive aquatic areas. i.e. dams, watercourses. Lower the rate of metsulfuron methyl (1g/100L) in areas where sensitive native species occur.	Small cottonbush plants can be easily hand pulled. Care if slashing due to grass fires from slasher.
Autumn	Flowering is finished and plant is no longer actively growing.	Hand pull out germinating seedlings, when pulling out mature plants cover with a plastic bag to prevent spread of seeds. Dispose by fire	Take care when using chemical control using non-selective herbicides (i.e. Glyphosate) or damage to pasture species will occur	Triclopyr (sold under various trade names) Use crop-oil such as Uptake® @ 500 mL 100 L, or DC-Trate @ 1 L / 100 L	Physically remove or slash plants if there is potential for off target damage to sensitive plant species. Treat regrowth and seedlings with glyphosate.	Follow up with targeted spraying or slashing. Small cottonbush plants can be easily hand pulled.
Winter	Plant is Dormant	Hand pull out seedlings.	Spot spray with glyphosate when plants actively growing with care not to damage pastures.	Triclopyr (sold under various trade names) Use crop-oil such as Uptake® @ 500 mL 100 L, or DC-Trate @ 1 L / 100 L	Physically remove or slash plants if there is potential for off target damage to sensitive plant species. Treat regrowth and seedlings with glyphosate.	Regrowth from slash plants can be treated with glyphosate. Watch for germination of new plants in newly cleared areas.
Spring	Cotton Bush is actively growing, Germination Occurs ,Flowers forming, Germination	Hand pull out germinating seedlings,	Spray with glyphosate when plants actively growing with care not to damage pastures.	Triclopyr (sold under various trade names) Use crop-oil such as Uptake® @ 500 mL 100 L, or DC-Trate @ 1 L / 100 L	Use Roundup® Biactive™ or Razor™ around sensitive aquatic areas. i.e. dams, watercourses. Lower the rate of metsulfuron methyl (1g/100L) in areas where sensitive native species occur.	Small cottonbush plants can be easily hand pulled.

Property Assessment Sheet

Date Site Mapped / /

Property Address	Postal Address	Contact Responsible for this Information Name: Ph: Email:	Land Owner contact Details Name: Ph: Email:
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Property Details

Coordinates _____
 Site in Hectares _____ (ha)
 Photo points marked on map Yes/No

Weed Species mapped on Site

Scientific name	Common Name	Area Infested (ha)	% density of cover of infestation	Treatments Applied		
				Method	Date	Cost

Photo Point Monitoring

This is an important document to show the work that has been undertaken on your property

Area	Photo Date / /	Photo Date / /	Photo Date / /
Photo Monitoring Point 1	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>
Comment			
Photo Monitoring Point 2	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>
Comment			

Photo Monitoring Point 3	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>
Comment			
Photo Monitoring Point 4	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>	<i>Insert Photo Here</i>
Comment			

3. Review Past Actions

- The history of paddock use such as crop or pasture is very useful to determine the management required.
- The nutrition history and seeding history
- The history of herbicide use can be used to prioritise weed management tactics to avoid the use of high risk herbicide mode-of-action groups and identify those paddocks that are at risk.

Table 1: Review past management actions

Paddock name	Weeds present on paddock	Use of paddock	Herbicide Used	Mechanical or Physical control	Nutrition and seeding	Notes
<i>Eg. Block 1</i>	<i>Cotton bush Paterson’s curse Cape tulip</i>	<i>Pasture cropping Hay Grazing</i>		<i>Hand pulling Slashing</i>	<i>Fertilizer applied Seed added to pasture</i>	

4. Weed Management Options.

Cultural control of declared plants

Cultural, physical and mechanical methods of weed control that you can use on your properties.

Grubbing and cultivation

Grubbing and cultivation can be used to control many annual weeds that are present as isolated plants or in small patches.

Perennial weeds that do not have an extensive root system can also be removed in this way. However, some perennial weeds, such as silverleaf nightshade and skeleton weed, are spread by cultivation, due to the ability of cut pieces of root to regenerate, as well as regeneration of plants from below the cultivation depth.

Mowing and slashing

Mowing and slashing are effective ways of controlling many annual thistles, but the timing of the operation is important. It is best carried out between the budding stage and first flowers. If done earlier than this, there is a risk that the severed stem will produce a new flowering shoot. If carried out later than early flowering, the cut portions of the plant may contain enough moisture for some of the immature seeds to reach maturity and become fully viable.

Burning

Burning on its own is of limited use in controlling weeds. However, it is a useful preliminary operation in the control of cape tulip. Burning destroys the surface trash and allows the maximum amount of water to penetrate the soil early in the season when ground temperatures are still warm, which stimulates a high proportion of the tulip corms and cormils to sprout.

Burning is also useful in destroying the dead canes after treatment in clumps of blackberry, thus thinning out the stand and making it easier to spray effectively in the following season. Burning mature cotton bush encourages dormant seeds to germinate. If the resulting seedlings are destroyed by other methods this will reduce the time required to control the weed. The burning of mature cotton bush also stimulates a pathogen to attack the base of the stems and cause rotting to set in.

Grazing

Grazing can destroy weeds or reduce their capacity to compete with pastures or produce seeds. Sheep especially will seek out and eat seedlings when there is no other green feed available. Paterson's curse can also be effectively controlled by heavy grazing. In fact, many badly weed infested paddocks result from poor pasture utilisation. Goats are particularly effective in grazing woody plants and also removing flowering heads from thistles.



Spray-grazing and spray-topping

[Spray-grazing](#) and [spray-topping](#) are weed control techniques that exploit the weed-killing potential of large numbers of stock grazing an infested pasture previously sprayed with a sub-lethal quantity of certain herbicides. Weeds sprayed with a sub-lethal dose of a phenoxy, hormone type herbicide appear to be more palatable to stock.

Competition

Competition between plants is important in the control of seedlings. In Western Australia pasture competition is mainly important in the control of winter-growing weeds because most of our pastures are based on winter-growing annuals. Seedlings of doublegees, Bathurst burr and skeleton weed are very sensitive to competition from other plant species.

Herbicide control

Herbicides give operators a degree of flexibility in control of weeds that is not available using other methods. Operators can vary the timing and size of the operation and in most cases, the cost is reasonably low.

When using a herbicide always read the label to ensure the herbicide is registered for the weed and situation you intend to use it for.

In many cases control of a weed is affected by a combination of strategies which together have a maximum impact on an infestation.

Herbicides

Herbicides play a vital role in integrated weed management programs. Knowledge of the mechanisms and activity of herbicides will improve the impact and sustainability of herbicides as a weed management tactic.

These pages are a general guide to the types of herbicides available and when and how they should be utilised.

Types of Herbicides

- **Translocated herbicides** move to the site of action via the transport mechanisms within the plant; the xylem and phloem. The xylem transports water and nutrients from the soil to growth sites and the phloem transports products of photosynthesis (for instance, sugars) to growth and storage sites. It may take up to two weeks for symptoms to develop on the target weeds depending on herbicide rate, conditions and species.
- **Contact herbicides** have limited movement within the plant, so complete coverage of the target is critical. Compared to translocated herbicides (e.g. glyphosate), contact herbicides (e.g. paraquat, oxyfluorfen, diquat and bromoxynil) tend to show symptoms rapidly, usually within 24 hours.
- **Selective herbicides** will kill target weeds and not desired plants (the crop or pasture) when applied at a specified application rate.
- **Non-selective herbicides** (also called knockdown herbicides) such as glyphosate or paraquat will damage most plants.
- **Residual herbicides** remain active in the soil for an extended period of time (months) and can act on successive weed germinations.
- **Non-residual herbicides**, such as the non-selective paraquat and glyphosate, have little or no soil activity and are quickly deactivated in the soil. They are either broken down or bound to soil particles, becoming less available to growing plants. They also may have little or no ability to be absorbed by roots.
- **Post-emergent and pre-emergent** are terms that refer to the target and timing of herbicide application. Post-emergent refers to foliar application of the herbicide after the target weeds have emerged from the soil, while pre-emergent refers to application of the herbicide to the soil before the weeds have emerged.
- **Herbicide mixtures and sequential applications** involve the application of more than one herbicide, usually to increase the spectrum of weed species controlled but also for resistance management. A mixture involves the application of multiple products in a single application. Where herbicides are antagonistic and cannot be mixed together in a single tank, they are applied sequentially.

Spray recommendations for common weeds

Weed	Spray recommendations (Only treat actively growing plants with herbicide)
Apple of Sodom <i>Solanum linnaeanum</i>	Amitrole T [®] : 1 part in 40 parts of water (1:40), plus 10g metsulfuron/100L of water, plus wetting agent at 1 part in 400 parts of water (1:400).
Arum lily <i>Zantedeschia aethiopica</i>	Chlorsulfuron: 1g in 50L of water (1:50), plus wetting agent at 1:400.
Blackberry <i>Rubus species</i>	Metsulfuron methyl: 10g per 100L (10:100), plus wetting agent at 1:400. Grazon DS [®] ** : 1 part in 300 (1:300), plus wetting agent and/or summer spraying oil at 1:400. Garlon 600 [®] ** and Glyphosate are also effective. Consult recommendations.
Cape tulip <i>Moraea flaccida</i>	Chlorsulfuron: 1g in 50L of water (1:50), plus wetting agent at 1:400. Metsulfuron methyl: 1g per 50L (1:50), plus wetting agent at 1:400.
Cotton bush <i>Gomphocarpus fruticosus</i>	Small infestations - pull out by hand, wear gloves. Glyphosate at 2L to 100L of water (2:100), plus 10g metsulfuron/100L of water, plus wetting agent at 1:400.
Doublegee <i>Emex australis</i>	Medicamine [®] **, 2,4-DB**, MCPA**, Tribunil for control in pasture with minimum clover loss. Dicamba **: 1:600 parts of water. (700ml/ha). Metsulfuron methyl and glyphosate can also be used, but with severe pasture loss.
Paterson's curse <i>Echium plantagineum</i>	Chlorsulfuron: 1g in 50L (20g/ha) of water, plus wetting agent. Metsulfuron methyl: 5 g/ha plus wetting agent at 1:400, for later season control.
Variiegated thistle <i>Silybum marianum</i>	2,4-D amine** at 2-5L/ha for seedlings, plus wetting agent at 1:600. Use higher rates for larger plants. Slashing of older plants to stop seeding is also effective.

Note: The herbicides marked ** are subject to the *Restricted Spraying Regulations Act 1979*.

A permit is required from the Department of Agriculture and Food for any applications of these chemicals within 5km of a commercial vineyard or tomato grower.

5. Weed control timing on your property.

List the weed and the relevant control technique within each season.

This will give you a quick reference guide and keep you on track to eradicating weeds on your property.

Weed Month	Cotton Bush				Location	Who will undertake the work
Site assessment, mapping and photo point establishment completed in spring of the previous year						
Jan						
Feb						
Mar						
Apr						
May						
Jun						
Jul						
Aug						
Sep						
Oct						
Nov						
Dec						

6. Hygiene - prevent weed seed introduction

'Risk-aware' growers can implement strategies to reduce and avoid unnecessary introduction and spread of weeds. These strategies will reduce not only the likelihood of introducing new weed species but also the risk of importing herbicide resistant weeds.

Impeding weed importation and spread at critical points

Sowing of the seed

Weed seed is regularly spread around and between farms as a contaminant of seed retained for sowing. Seed for sowing is more often than not contaminated with weed seeds and frequently at very high levels. Check seed analysis before buying seed-lots.

Fencelines and non-cropped areas in cropping paddocks (e.g. water courses)

Weed infestations often start in non-crop areas (for example, around buildings, along roadsides, along fencelines). Weeds in non-crop areas experience no crop competition and can produce large quantities of seed. Controlling these initial populations will prevent weeds from spreading to other parts of the property.

Machinery and vehicle usage

Strict vehicle hygiene (that is, regular cleaning) can reduce the risk of new infestations and weed spread.

Stock feed and livestock movement

New livestock, or those returning to the property from agistment, can carry weed seeds from other areas. Weeds can be easily imported from different regions or states because livestock can travel significant distances by road within a 24-hour period. Quarantine contaminated fodder in a sacrifice paddock or feedlot so weeds are contained in a small area.

Sow weed-free seed

Determining weed seed contamination levels

To estimate the number of weed seeds being introduced at sowing:

1. Obtain a random 1 kilogram (kg) sample of the seed to be sown.
2. Separate the foreign seed from the crop seed.
3. Count each type of foreign seed, including weeds and volunteer crop seeds.
4. Multiply the number of weed seeds of each species by the proposed crop sowing rate kilograms per hectare (kg/ha) This will give the number of weeds potentially sown per hectare of crop.
5. To calculate the density of weeds per metre squared (m^2), divide the weeds/ha by 10 000.

While the number may work out to be only small (perhaps 1 to 2 weeds/ m^2 or less), it is important to remember many weed species are prolific seed producers and a single plant growing in ideal conditions can contribute a large number of seeds to the seedbank.

Managing weeds in non-crop areas

Practices to control weeds around the farm

Many weeds are well-adapted to non-arable areas of the farm and thrive in stockyards, laneways, firebreaks around sheds and buildings and in tree plantings.

These non-arable areas are the home to an assortment of annual and perennial weeds and can create problems in many ways:

- They can be a source of weed seeds for the introduction to other areas of the farm.
- They can present a fire hazard.
- They can harbour vermin and insects pests and act as hosts for some plant diseases.
- They detract from the appearance of the farm.

Weed control around farm buildings

Controlling weeds around farm buildings is required by law to reduce a potential fire hazard. This can be achieved by regular mowing or herbicide application by knapsack sprayer or pressurised hand lead. Knockdown or residual herbicides (or a combination of the two) can be used depending on whether the weeds have emerged, the time of year and the weeds present.

Chemical firebreaks

These can replace or supplement mechanical methods. Advantages include the reduced risks of soil erosion, weed reinfestation and damage to fences by fire as well as providing greater flexibility and speed as show in Figure 1 below.

Figure 1 Chemical created firebreak along a fence line.



Knockdown or residual herbicides (or a combination of both) can be used.

Weed control on road catchments

Weed growth can significantly reduce run-off by breaking up the surface seal and increasing infiltration, and by holding a small part of each shower of rain. Weeds also reduce raindrop impact on the soil surface. Raindrop impact causes a crust to form on the soil surface which limits the rate of water infiltration into the soil. Most run-off occurs during winter, so early control of winter-growing annual weeds is important. Regular maintenance and regrading the catchment will control weeds. In between regrading however, apply appropriate (knockdown or residual) herbicides. Residual herbicides can be washed off compacted clay surfaces contaminating run-off water — the choice of herbicide is largely decided by the end-use of the water.

Water weed control in dams

Rising temperatures and falling water levels during summer often lead to the appearance of aquatic weeds. The most commonly-found species are floating pond weed, blunt pond weed, duck weed, red azolla and common milfoil. Before deciding whether to control weeds in dams, remember they may be beneficial and provide food and shelter for fish, other aquatic animals and birds. They might also use nutrients in the dam preventing nutrient enrichment that could lead to algal blooms. Aquatic weeds can be controlled by mechanical and/or chemical means. Mechanical methods such as cutting, mowing, dredging, drying and chaining may be effective but are short-lived. Chemical control must be undertaken with considerable care, considering the identity of the weed, the effect of herbicides on desirable plants, fish and other aquatic life and the eventual use of the water (irrigation, domestic purposes or stock). Take your water weed to your local agronomist or DAFWA office for correct identification and control advice.

Weed control for successful revegetation

Successful establishment of trees from seedlings depends on successful weed control. Weeds around trees compete with young seedlings, harbour pests and vermin (rabbits), cause spindly growth and present a fire hazard when dry.