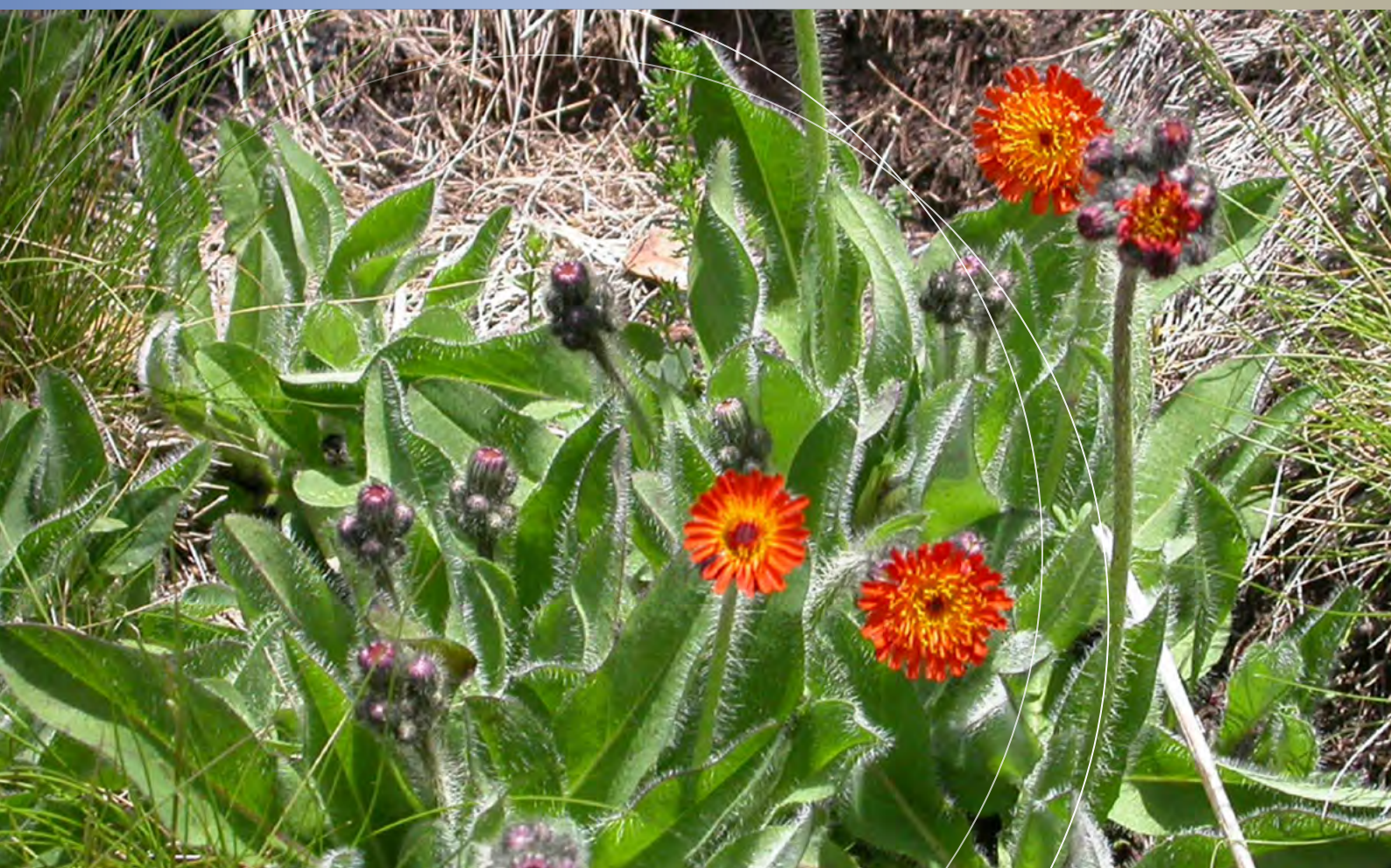


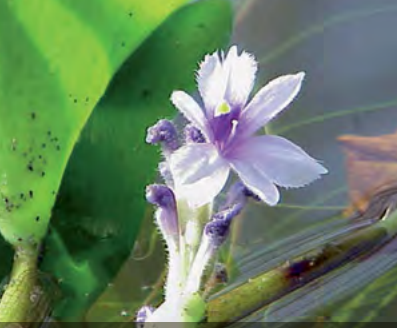
# Noxious and environmental weed control handbook

a guide to weed control in non-crop,  
aquatic and bushland situations

NSW DPI MANAGEMENT GUIDE, SIXTH EDITION



Invasive Plants and Animals Branch



Anchored water hyacinth

# Weed Alert: Have you seen these water weeds?



Horsetail



Lagarosiphon

If you have seen these plants please contact your local council weeds officer, the NSW Invasive Plants & Animals Enquiry line 1800 680 244 or email [weeds@dpi.nsw.gov.au](mailto:weeds@dpi.nsw.gov.au)



Kidney-leaf mud plantain



Water caltrop



Hymenachne



Alligator weed



Water pennywort



Yellow burrhead



Eurasian water milfoil



Hygrophila



Long-leaf willow primrose



Water soldier

**For more information  
about weeds visit our website  
[www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)**



Senegal tea plant



Department of  
Primary Industries

NEW SOUTH WALES  
WEEDS ACTION PROGRAM



Department of  
Primary Industries

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[www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

*Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations* 6th Edition

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This edition replaces the 5th edition 2011.

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ISSN 1443-0622

Published by the Department of Primary Industries, a part of the Department of Department of Trade and Investment, Regional Infrastructure and Services.

For copies of this publication please contact your local council weeds officer.

## Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (November 2014). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up-to-date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent adviser.

## Important: ALWAYS READ THE LABEL

Users of agricultural (or veterinary) chemical products must always read the label and any Permit, before using the product and strictly comply with the directions on the label and conditions of any Permit. Users are not absolved from compliance with the directions on the label or conditions of the Permit by reason of any statement made or omitted to be made in this publication.

## Other publications

This handbook has been compiled as a guide for noxious and environmental weed control in non-crop, aquatic and bushland situations. For crop or pasture situations, see the following NSW DPI publications:

*Weed control in winter crops*

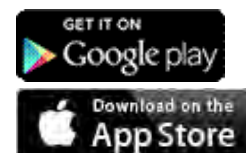
*Weed control in summer crops*

*Weed control in lucerne and pastures*

## NSW WeedWise app



NSW WeedWise is NSW DPI's free mobile weeds app, incorporating the Noxious and Environmental Weed Control Handbook as well as weed profiles and legal requirements for weeds in NSW. It will be available on Google play and the App Store from February 2015.



## Cover photographs

### Front cover

- Orange hawkweed (*Hieracium aurantiacum*) – a Class 1 State Prohibited weed in New South Wales. Photo: Neville Walsh.

### Inside front cover

- Anchored water hyacinth (*Eichhornia azurea*). Photo: Kurt Stuber, Max-Planck Institute for Plant Breeding Research
- Horsetail (*Equisetum* species). Photo: Bob Trounce.
- Lagarosiphon (*Lagarosiphon major*) Photo: Sainty and Associates.
- Kidney-leaf mud plantain (*Heteranthera reniformis*). Photo: Sue Hayward.
- Water caltrop (*Trapa natans*). Photo: Sainty and Associates.
- Hymenachne (*Hymenachne amplexicaulis*). Photo: Department of Natural Resources, Mines and Water, Queensland (QNRM&W).
- Alligator weed (*Alternanthera philoxeroides*). Photo: Brian Worboys, Maitland City Council.
- Water pennywort (*Hydrocotyl ranunculoides*). Photo: Jessica Grantley.
- Yellow burrhead (*Limnocharis flava*). Photo: K. Galway, QNRM&W.
- Eurasian water milfoil (*Myriophyllum spicatum*). Photo: Alison Fox. [www.forestryimages.org](http://www.forestryimages.org)
- Hygrophila (*Hygrophila costata*). Photo: P. Gorham.
- Long-leaf willow primrose (*Ludwigia longifolia*). Photo: Peter Gorham.
- Water soldier (*Statiotes aloides*). Photo: Malcolm Storey, [www.bioimages.org.uk](http://www.bioimages.org.uk)
- Senegal tea plant (*Gymnocoronis spilanthoides*).

# Contents

<b>Integrated weed management</b>	<b>4</b>
<b>Legal responsibilities associated with pesticide use</b>	<b>7</b>
<b>Reducing herbicide spray drift</b>	<b>13</b>
<b>Using adjuvants with herbicides</b>	<b>17</b>
<b>Cleaning spray equipment</b>	<b>18</b>
<b>Withholding periods</b>	<b>19</b>
<b>Herbicide resistance</b>	<b>20</b>
<b>Control techniques using herbicides</b>	<b>21</b>
<b>Weeds declared noxious in New South Wales</b>	<b>24</b>
<b>Minor-use permits</b>	<b>27</b>
<b>Noxious and environmental weed control</b>	<b>28</b>
<b>Appendix 1: Spray calibration methods</b>	<b>90</b>

# Integrated weed management

Integrated weed management is the coordinated use of a variety of control methods, reducing reliance on herbicides alone, and increasing the chances of successful control or eradication. Integrated weed management programs require long-term planning, knowledge of a weed's biology and ecology and appropriate weed control methods.

For example, an integrated weed management program for a large infestation of lantana on grazing land would involve:

- removing stock for several months
- burning at the appropriate time (depending on the terrain and access, burning could be substituted with bulldozing or slashing to reduce the bulk of the mature plants)
- sowing an improved pasture in early summer
- continuing to exclude stock until pasture establishes
- following-up with herbicide spot spraying on regrowth
- repeating this regime for 2 or 3 years.

## Biological control

Biological control of weeds uses a plant's natural enemies such as insects, mites and diseases to reduce and control its population. It is an economical, effective and environmentally sound method, but is a long-term technique with extensive development and establishment phases. Biocontrol does not eradicate a weed, but can reduce it to an acceptable level, or suppress it to a level where it can be controlled with other methods.

**Inundative** biological control uses mycoherbicides – plant pathogens such as rusts and fungi – applied as a treatment. They are likened to a species-specific natural herbicide, are not self-sustaining and have a short active period.

**Classical** biological control is the release and establishment of control agents such as insects, rusts and mites into the target weed infestation, creating a natural balance between the weed and its control agent – similar to that found in the weed's native range.

If an agent establishes a population, control becomes self-perpetuating and self-regulating as the agent becomes part of the region's ecology. Monitoring an agent's population dynamics is an important part of a biocontrol strategy.

Biological control should be considered when a control agent has achieved good control in other areas. However, successful programs may take more than 10 years to be effective, and results may vary from area to area. Biological control is practical and effective for:

- inaccessible areas such as timbered, rocky and steep locations
- areas of low-priority for control
- situations where biocontrol is the only option, for example sensitive aquatic areas
- situations where chemical control may be too expensive or not effective.

## Flaming

Flaming is not a common or well-developed control method in Australia, however in Sweden it has been used for many decades for:

- weed control on organic farms
- pre-emergent weed control in carrots and other slow-germinating row crops
- selective post-emergent control in heat-tolerant crops
- general weed control on hard surfaces in urban areas.

Liquefied petroleum gas or propane is used in flame weeders. The process does not require a weed to be burnt, but ruptures the plant's cell membranes by raising its water content to temperatures to above 100°C.

Small seedlings are generally more susceptible to flaming. Species with upright habits and thin leaves are more sensitive than species with a low stature and protected growth points.

## Steaming

Steaming is a relatively new weed control method, still in the developmental stage. Applying hot water to a weed results in the loss of the plant's waxy coating, a reduction in moisture, dehydration and death.

The system operates by plumbing water under pressure through a heated chamber, and applying it to the weed. The combination of heat and water pressure breaks down the cellular structure, causing discolouration and death within hours or over a few days.

Field trials carried out in New Zealand have shown that steaming kills annual weeds in 24 hours. The foliage from some perennials also dies within 24 hours, but regrowth recurs from the roots within a week or two.

City councils in Australia have trialled the equipment with mixed results. Trial work and assessments in various situations are still being conducted.

## Goats

Controlling weeds with goats is a medium-to-long-term proposition and can be highly effective in certain situations. Goats can be integrated with sheep, cattle and cropping enterprises to provide weed control and pasture improvement. Generally, goats should be only one aspect of an integrated weed control program and stocking rates, timing, weed palatability and farm management strategies need to be considered. It is usually important to have a competitive pasture to colonise bare areas.

Goats control weeds by selectively grazing their foliage, bark, stems and flowers. Goats eat a variety of weed species that sheep

and cattle avoid, such as blackberry, sweet briar, scotch broom, thistles, Paterson's curse and horehound. The nutritional value of these species can be quite high. Occasionally goats will eat fireweed, groundsel bush, St John's wort, serrated tussock and spear grass. Goats are grazers of weeds in inaccessible areas where conventional control methods are not possible.

## Herbicides

Herbicides are widely used to control weeds in agricultural, commercial and domestic situations. Herbicides are chemicals that kill plants by affecting their enzyme systems, interfering with their growth processes, replacing their hormones or blocking their chemical reactions. Herbicides are effective and practical in a wide variety of situations, and often provide the most economical means of control.

Some herbicides act on contact with the plant; others need to be translocated through the plant's system.

### Contact herbicides

Contact herbicides kill the parts of the plants they are applied to – usually limited to leaves and stems of the plant. They are more effective on annual weeds or on seedlings of perennial weeds. Contact herbicides can be either selective (i.e. they only kill broadleaf plants) or non-selective (i.e. they kill all plants). Plants need to be actively growing when contact herbicides are applied, and good coverage is required to achieve effective results. Contact herbicides include paraquat and diquat.

### Translocated herbicides

Translocated herbicides must be moved around a plant's system. They disrupt growth processes and interfere with biochemical reactions. This usually occurs where cells are actively dividing in growth tissue, such as at the bases of stems in grasses, and in growing tips or buds in broadleaf weeds. Translocated herbicides include glyphosate and metsulfuron-methyl.

### Regulation of herbicides

The *Pesticides Act 1999* (NSW) provides for registration of herbicides, labels and containers. Only registered herbicides can be used to control weeds according to the directions on the product label. Labels are designed to prevent misuse of a product, and users have a legal obligation to read and follow the instructions on it.

### Handling and applying herbicides

Herbicides can have potentially harmful effects on human health, livestock, and the environment. Trained users can avoid adverse effects by following the instructions on the product label.

Equipment for herbicide applications includes boom sprayers, hand guns, knapsacks, wick-wipers, granular applicators, aerial sprayers and gas guns. Application methods include foliar spraying, basal bark and cut stump applications, stem injection, and wick-wiping.

The choice of equipment and application method depends on the size of the infestation, type and susceptibility of weed, topography, access, and potential environmental and health hazards. For herbicide treatments to be safe and effective,

weather, soil conditions and the timing of the treatment must be considered. Weather conditions should be assessed and monitored during treatments to reduce the risk of drift and off-target damage. If heavy rain follows application, effectiveness can be reduced and contamination of waterways can occur through run-off.

## Cultivation

Destroying weeds through cultivation is a proven method of control. It is particularly effective on young weeds. Implements are used to dig up and destroy weeds, ranging from large tractors, discs and ploughs to hand tools such as mattocks and chip hoes. Shoots can be separated from their roots or buried deeply to prevent regrowth, and roots can be dragged to the surface to dry out. Some types of weeds can be controlled with repeated passes; however eradication of perennial weeds can be difficult and depends on their root systems.

Cultivation is more effective if weeds are cultivated before they flower and under reasonably dry conditions. Manual cultivation is a viable means of weed control in small-scale situations or as a follow-up control measure.

## Slashing

Slashing can be done mechanically with a tractor and slasher or by using a hand-held brush-cutter. It is cheaper than cultivation and preserves ground cover, reducing soil erosion and allowing access in wet weather. Continual slashing may provide control if a desirable pasture species is present and encouraged to replace the weed, but slashing will not eradicate a weed, and can't be used for weed control in crops.

Slashing can:

- prevent tall weeds from flowering and seeding
- remove unpalatable or inedible weeds left after stock have selectively grazed a paddock
- temporarily control weeds until they re-shoot
- control vegetation and weeds along roadsides

However, slashing can also have negative effects, such as encouraging the growth of less desirable weed species, or spreading weeds that grow vegetatively.

## Mulching

Mulching involves the use of physical barriers such as black plastic or woven weed matting to exclude sunlight and prevent weed establishment. Mulching is used for weed control in row crop production such as strawberries, where machinery lays black plastic between rows. Woven weed matting is useful along roadsides, steep banks and cuttings where areas need to be revegetated and where bank stabilisation is necessary.

Natural mulches include sawdust, timber chips, straw, manures and grass clippings. These have other beneficial effects including adding organic matter and nutrients to the soil. However there can be a risk of introducing weed seeds in the mulch material.

Most perennial weeds can penetrate mulches such as sawdust and wood chips.

## Fire

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The success of fire as a weed control method depends on the amount of fuel, the speed and intensity of the fire, and the time of year that burning takes place. Fire is a major control method for woody weeds in western regions of NSW, and can be a useful for controlling lantana and blackberry in certain situations. Fire is best used as part of an integrated weed management program.

Unlike wildfire, a controlled burn – where only the desired area is burned using firebreaks and back-burning techniques – is the best approach for woody weed control. Direct costs are lower than alternative methods such as herbicide treatments or mechanical clearing. A controlled burn:

- minimises damage to the environment
- avoids damage to property and livestock
- helps restore land to an open condition suitable for pasture
- creates access for further weed control.

## Reafforestation

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Reafforestation is a long-term method of weed control, where a dense tree canopy is formed to restrict sunlight penetration to weeds on the forest floor. Reafforestation can be in the form of revegetation with native species or through establishment of plantation forests. A weed control program can involve agro-forestry principles, which include growing trees in conjunction with other agricultural enterprises such as cropping or domestic animals. Reafforestation is suitable over large areas where other forms of weed control are uneconomic or impractical.

Mature trees compete for moisture, nutrients and sunlight and restrict potential weed establishment and growth. It can take 5 to 10 years before trees form a dense canopy and during this establishment phase it is critical to undertake other forms of weed control. A competitive, desirable, shade-tolerant grass or legume can also assist with weed control.

## Land management

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Good land management is critical to reducing the incidence and impact of weeds. The initial increased costs associated with better land management are compensated with reduced weed control. Management strategies that help to reduce weed problems include:

- maintenance of pastures or desirable ground covers
- reduced disturbances and tillage
- management of nutrient run-off
- grazing management
- early weed identification
- good weed hygiene.

## Grazing and pasture management

Competitive, desirable pastures can provide effective weed control. Stocking rates must be managed so as not to cause overgrazing, as weeds will establish in overgrazed areas.

A vigorous pasture competes more effectively with weeds and has added benefits of increased production. Weeds can be controlled in a pasture situation by improving the existing pasture or replacing it with a more suitable or competitive species. Pastures can be improved by adding fertilisers and lime according to soil test results.

## Crop management

Crop rotations can minimise weed problems, help control diseases and insects, and improve soil fertility and structure – producing increased yields. Crop rotations can break the seeding and germinating cycle of the weeds.

## Weed hygiene

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Weed hygiene includes sowing only weed-free seed, cleaning machinery and vehicles, checking clothing and equipment for weed seeds or weed fragments, and removing sources of weed reinfestation around a control site.

New livestock being introduced to a property should be quarantined for several days so any potential weed seeds can pass through their systems into a known area, and be treated later.

## Weed identification

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When weeds are identified in the early stages of their infestation, eradication is more likely. Control is economical when carried out early, rather than waiting until the weed infestation has spread and become established.



# Legal responsibilities associated with pesticide use

The *Pesticides Act 1999* is the primary legislation controlling the use of pesticides<sup>1</sup> in NSW and is administered by the NSW Environment Protection Authority (EPA). The underlying principle of the Act is that pesticides must be used only for the purpose described on the product label and all the instructions on the label must be followed. Consequently, all label directions must be read by, or explained to, the user before each use of the pesticide.

All pesticide users should take reasonable care to protect their own health and the health of others when using a pesticide. They should also make every reasonable attempt to prevent damage occurring from the use of a pesticide, such as off-target drift on to sensitive areas or harm to endangered and protected species.

## Record keeping

The Pesticides Regulation 2009 requires all commercial pesticide users (that is, all farmers and spray contractors) to keep records of their pesticide application. Records must be made within 24 hours of application in legible English, and kept for 3 years.

**While no set form has to be used, records must include the following:**

- full product name
- description of the crop or situation
- rate of application and quantity applied
- description of the equipment used
- address of the property, identification of the area treated and order of paddocks treated
- date and time of the application (including start and finish)
- name, address, and contact details of the applicator and of the employer or owner if an employee or contractor is the applicator
- estimated wind speed and direction (including any significant changes during application)
- other weather conditions specified on the label as being relevant (temperature, rainfall, relative humidity).

A form that captures all the information required by the Regulation, together with notes on how to fill it in, is included on page 8.

A self-carboning record book is available from the SMARTtrain National Support Centre at Yanco. Phone 1800 138 351.

## How to complete a pesticide application record

Record forms should be filled in before the start of application. In the case of property owners using contractors or employees as applicators, the information should be given to them before they start the job, and a copy of the record should be kept by both the applicator and the property owner.

### Property/holding:

Attach a detailed property map (such as a line drawing), showing adjoining sensitive areas, with paddocks and other features clearly identified. Fill in the residential address and the address of the property on which the chemical is applied if they are not the same.

### Applicator details:

The applicator, or person applying the pesticide, must fill in their contact details. If the applicator is not the owner (for instance, a contractor or employee) then the owner's details also have to be filled in.

### Sensitive area identification:

If there are sensitive areas, either on the property or on land adjoining, these should be identified in advance and marked on the sensitive areas diagram, together with any precautions or special instructions. The property map with sensitive areas marked should be shown to them, and the job fully discussed.

### Paddock identification:

Identify the property and paddocks/blocks and order of treatments (if more than one) in the 'paddock' row of the form. This should be filled in before the start of application, along with the residential address. Applicators using global positioning systems (GPS) could include a GPS reading in addition to the paddock number/name.

### Crop/animal identification:

The left-hand side of the table is for crops, pastures and plants (non-crop, bushland and fallow); the right-hand side for animals. As a minimum, identify the host (crop/situation) and the weed. It is useful to provide as much detail about the weed as possible, for instance, '4-leaf'. Addition of details such as crop variety and growth stage are often important for quality assurance schemes, but may also be necessary to identify the area treated, as required by the Regulation.

<sup>1</sup> Pesticides by definition include herbicides, and the use of the term here includes reference to herbicides.

## Example record keeping sheet

Property holding (residential address):					Date:	
Applicator's full name:				Owner (if not applicant):		
Address:				Address		
Phone:	Fax:	Email:	Phone:	Fax:	Email:	
Mobile:			Mobile:			
Sensitive areas (incl distances and buffers): N  W  S			Comments (incl risk controls for sensitive areas):			
Paddock no/name:		Paddock area:		Order paddocks sprayed:		
Crop/situation:			Type of animals:			
Crop/pasture/variety:			Age/growth stage:			
Growth stage:			Mob/paddock/shed:			
Pest/weed/disease:			No animals treated:			
Pest density/incidence: Heavy <input type="checkbox"/> Medium <input type="checkbox"/> Light <input type="checkbox"/>						
Full product name:			Rate/dose:		Water rate (L/ha):	
Permit no:		Expiry date:	Adjuvants:		Total ha:	
Total L or kg:		WHP:	ESI:		Date suitable sale:	
Equipment type:		Release height:	Speed:	Nozzle type*:	Pressure:	
Date last calibrated:		Water quality (pH and/or description):				
Showers <input type="checkbox"/>		Overcast <input type="checkbox"/>		Light cloud <input type="checkbox"/>	Clear sky <input type="checkbox"/>	
Rainfall (24 hours before and after)						
Before		mm		During		
mm		mm		After		
mm		mm		mm		
Time	Temperature	RH %	Wind speed	Direction	Variability	
Start:						
Finish:						
Comments:						

\* Include brand and capacity, e.g. TeeJet AI 11002.

## Product details:

The product name and rate should be transcribed from the label. For tank mixes, include all products in the mixture.

If the use pattern is registered on a permit, include the permit number and expiry date as well as the label details and the product name. Current permits can be obtained from the APVMA website at [www.apvma.gov.au](http://www.apvma.gov.au). The permit rate may vary from that on the label.

The water rate may come from the label or from standard practice or as a result of equipment calibration. If additives or wetters are included in the mixture, it is helpful to note these.

The total L/kg can be calculated when the application is finished.

If the label has a withholding period (WHP), for example 7 days, note this down.

## Equipment details:

As a minimum; record what equipment was used. Specify the settings used for the application: for instance, nozzle type and angle, and pressure. The nozzle type will usually include the angle. Pressure readings should be as close to the nozzle as possible. Other details are useful as a reminder for future use or for checking the set-up should there be a treatment failure: for instance, date of calibration and water quality.

Water quality is important for herbicide efficacy, and water quality can be described in terms of its source: for instance, rainwater, dam water, bore water.

## Weather:

Weather records have to be made when using any equipment that distributes pesticide through the air. As a minimum; record wind speed and direction. This is better measured with instruments than estimated. Record any changes during application. Also record the time of day that chemical application started and finished. Rainfall should be recorded for the 24 hours before and the 24 hours after application, unless a different requirement is made in the restraints or critical comments sections of the label. Rainfall before or after herbicide application can affect efficacy.

Temperature and relative humidity should also be recorded, particularly if either or both are referred to in the restraints or critical comments sections of the label. Temperature and relative humidity can affect efficacy and increase the risk of off-target drift or may damage the host (phytotoxicity), or a combination of all three.

## Pesticide user training

The Pesticides Regulation 2009 requires all commercial pesticide users to be trained in pesticide application. The training of aerial applicators, pest control operators and fumigators is recognised as satisfying the requirements of the Regulation. Apart from these groups, all commercial users must have a prescribed qualification. Only domestic use, such as home gardens, is excluded, provided the pesticide is a specific domestic/home garden product.

Pesticides used in the following situations are covered by the Regulation and therefore require training in pest control:

- public authorities, e.g. state rail
- golf courses, sporting fields and bowling greens
- agricultural, horticultural, aquacultural and forestry operations
- businesses, educational institutions and hospitals.

The minimum prescribed training qualification is the AQF2 unit of competency, 'Apply chemicals under supervision'. Pesticide users are encouraged to train and be assessed in the two higher AQF3 competencies, 'Prepare and apply chemicals' and 'Transport, handle and store chemicals'. The SMARTtrain course Chemical Application and the standard ChemCert course both cover the AQF3 competencies. For pesticide users with literacy or numeracy problems the AQF2 competency provides the minimum qualification that satisfies the Regulation.

## Notification plan

The Pesticides Regulation 2009 includes a requirement to notify the public about pesticide application. This requirement affects public authorities controlling weeds in public places.

The Regulation requires the development of a notification plan for public places where pesticides are applied and to which the public has access. Public places requiring a notification plan include aquatic areas, gardens, picnic areas, playgrounds, parks, sporting fields, road verges, electricity or rail easements legally accessible by the public, national parks, state forest, crown lands, public schools and TAFEs. Public authorities include government departments, statutory bodies and staff or persons who exercise functions on behalf of a public authority such as weed contractors for a local council.

The plan has to define the means by which the community will be notified of pesticide application to public places, such as on-site signs, letters to affected community members, and news items in the local paper or on the local radio.

The notification plan should set out what information about the proposed pesticide application will be provided to the community. This should include (as a minimum) the product name of pesticide applied, the purpose for which the pesticide was applied (e.g. weed control), the place applied, the date applied, applicator contact details (phone number and/or internet address) and re-entry period (if relevant).

Once the plan is drafted, it is necessary to develop arrangements for public input. The finalised plan has to be accessible to the public and the NSW Environment Protection Authority has to be notified in writing that the plan has been prepared and finalised in compliance with the Regulation.

## Work Health and Safety

### Hazardous substances legislation

Many registered pesticides are classified as hazardous substances. Most of those that are not still pose some risk to the health of those who use them or are exposed to them.

*The Work Health and Safety Act 2011* and the Hazardous Chemicals section of the Work Health and Safety Regulation 2011 give details of the legal requirements of suppliers, employers and employees in the workplace for hazardous chemicals management. They aim to protect workers from both the short- and long-term health effects of exposure to hazardous chemicals and to improve current health and safety practices by:

- provision of health and safety information to workers (including a list or register of all hazardous chemicals and an MSDS for each hazardous chemical)
- consultation with workers
- training of workers
- assessment of the risks arising from hazardous chemical exposure
- control of the risks
- recording of the risk assessment and control measures implemented, training of those applying and exposed to hazardous chemicals, and health surveillance (if warranted by the risk assessment in respect of organophosphates).

Both storage and use are covered by the *Work Health and Safety Act 2011*. Records of training and risk assessments have to be kept for five years.

### Dangerous goods legislation

The Dangerous Goods (Road and Rail Transport) Regulation 2014 under the *Dangerous Goods (Road and Rail Transport) Act 2008* has been revised to align with hazardous substances legislation. The main requirements include:

- provision of Safety Data Sheets (SDS)
- carrying out and documenting risk assessments
- keeping a register of Dangerous Goods.

All these requirements already apply to hazardous substances. In practice, they require the addition of any Dangerous Goods that are not also hazardous substances to existing management and record systems.

Premises storing large quantities are now required to placard both the storage shed and the entrances to the premises. If very large quantities are stored – which would be rare on-farm, a manifest, site plan and written emergency plan are required. Consult your local WorkCover office for advice.

WorkCover NSW's *Code of Practice for the Safe Use and Storage of Chemicals (Including Pesticides and Herbicides) in Agriculture* is an approved industry code of practice and provides practical guidance to help farm chemical users to comply with the legislation. This has been revised to reflect the new Dangerous Goods requirements.

Copies can be obtained from your local WorkCover office, by download from the WorkCover website – [www.workcover.nsw.gov.au](http://www.workcover.nsw.gov.au) – or by ringing 1300 799 003.

### Pesticides and worker safety

Pesticides can have both immediate (acute) effects and long-term (chronic) effects on the health of people who are exposed to them.

#### Acute toxicity

The acute or immediate toxicity of a farm chemical is reflected in the Poisons Schedule or poison warnings, which appear on the label of a pesticide product. The acute toxicity is assessed in terms of the potential of the active ingredient of the chemical to poison an individual by the route of exposure that is most lethal, for example, by ingestion (swallowing).

#### Poisons Schedule

The Poisons Schedule has nine categories. Of these, pesticides are classified into four of the categories on the basis of their acute health hazard to the user of the pesticide. Each schedule has a corresponding label heading, which appears in large contrasting lettering on the label of the pesticide product.

Signal heading	Toxicity	Label heading
Unscheduled	Very low toxicity	No heading required
Schedule 5	Slightly toxic	Caution
Schedule 6	Moderately toxic	Poison
Schedule 7	Highly toxic	Dangerous Poison

The Poisons Schedule determines the Safety Directions and First Aid Instructions that appear on the label. The Safety Directions specify what personal protective equipment (PPE) should be worn and what safety precautions should be taken, for example, 'Do not inhale spray mist'. The First Aid Instructions specify what action should be taken in the event of poisoning. Safety Directions and First Aid Instructions may be different for different formulations of the same pesticides.

**Note:** Before opening and using any farm chemical, consult the label and the Safety Data Sheet (SDS) for specific Safety Directions. The *Hazardous Chemicals* section of the Work Health and Safety Regulation 2011 requires the reseller to provide the end-user with an SDS.

If you suspect poisoning, contact the Poisons Information Centre, emergency phone (24-hour) 131 126.

#### Solvents and distillates

In addition to the active ingredient, pesticide formulations contain surfactants and carriers that may also be toxic. Many liquid pesticide formulations are based on petroleum distillates or organic solvents, which are corrosive to the skin and eyes, and their vapours may affect the brain if inhaled. An example of such a distillate is xylene, which is highly toxic. As with the active ingredient, the exposure risk is highest when handling the concentrate. This is why pesticide labels often carry warnings to avoid inhaling vapours and splashes to the skin and eyes.

### **Routes of exposure**

With all pesticides (except fumigants) the most hazardous route of exposure is dermal absorption (through the skin) and the most hazardous phase of application is mixing and loading the concentrated product.

With the exception of fumigants, the inhalation risk for most pesticides and application technology is low. Nevertheless, a respirator may be required when mixing/loading or applying pesticides:

- in an enclosed space (such as a shed)
- if the pesticide is highly volatile and liable to be breathed as a vapour
- if application carries the risk of inhaling the spray mist (such as having to turn back into the drift in crops with short rows).

Ingestion or swallowing is a risk to applicators who don't wash their hands before eating and drinking or who smoke during application. Unsecured storages represent a high risk to children, who could accidentally ingest a pesticide.

Many pesticide formulations can have direct or topical effects on the skin and eyes. These effects are often unrelated to whether or not the chemical is acutely toxic. Some pesticides may have low acute toxicity but severe topical effects. For example, glyphosate has very low acute toxicity but is irritating to the skin and eyes. Warnings regarding skin and eye irritation and other topical effects are usually found on the product label under 'Safety Directions'.

### **Re-entry intervals**

The re-entry interval is the time that must elapse between applying the pesticide and re-entry of people into the sprayed crop, unless the PPE specified for re-entry on the label is worn. The reason for setting a re-entry interval is that pesticides sometimes remain on crops in the form of foliar aerosol particles. These residues can be dislodged by contact with the crop and absorbed through the skin by those working in the crop.

Re-entry intervals appear on the labels of only a small number of pesticide products. These include newer products, or older products that have been subject to a technical review by the Australian Pesticides and Veterinary Medicines Authority (APVMA). If a re-entry period is not specified on the label, the rule of thumb is to wait 24 hours after application or until the crop is dry, whichever is the longer. Crops should never be re-entered when wet from dew or light rain, irrespective of the time elapsed, unless appropriate PPE is worn.

### **Chronic toxicity**

The effect of long-term exposure to small doses of chemical is referred to as chronic toxicity. Some of these chronic toxicity effects include:

- neurotoxic effects (toxic effects on the brain and central nervous system)
- reproductive system effects
- carcinogenicity (causing cancer)
- endocrine (hormone) disruption.

### **Neurotoxic effects**

Organophosphate pesticides (insecticides) are suspected of having long-term, subtle effects on the central nervous system. The effects detected to date are slight and have been detected only in a tiny proportion of those exposed. What is clear is that all effects, both acute and chronic, are dose related. This means that adhering to the label directions to control acute exposure will similarly control chronic exposure.

### **Reproductive effects**

Some pesticides are suspected of being fetotoxic (fatal to foetuses) and teratogenic (causing birth defects) on the basis of laboratory studies involving animals. However, there is little evidence that pesticides can affect human reproduction or the health of the unborn foetus at the levels of pesticide exposure that most of the population experiences through their food supply.

The Australian College of Occupational Medicine recommends that women who are pregnant or likely to become pregnant protect themselves against chemical exposures that may have adverse reproductive effects. Pregnant women should not be involved in spraying agricultural chemicals or working in recently sprayed crops. Advice on pregnancy and occupational exposure to pesticides can be obtained from a medical practitioner accredited by WorkCover NSW in occupational health.

### **Cancer and pesticides**

Despite widespread public suspicion of pesticides as cancer-causing agents, evidence is lacking to implicate all but a few. As most cancers are caused by a multiplicity of factors, it is extremely difficult to determine whether or not a particular cancer was the result of pesticide exposure or other factors. Apart from the organochlorines and arsenic, which are now banned, only chlorothalonil, dichlorvos and amitrole have been classified as possible (less weight of evidence than probable) carcinogens by the World Health Organisation.

### **Endocrine disruption**

The endocrine system is made up of many glands in the body and the hormones they secrete. These hormones guide the development, growth, reproduction and behaviour of all animals, including humans. The female ovaries and male testes are endocrine glands. Endocrine disruptors are chemicals that interfere with the normal functioning of the endocrine system. Large acute exposure to some chemicals such as the organochlorines has caused adverse effects to the endocrine systems of animals.

It is unclear whether long-term, low-level exposure to endocrine-disrupting chemicals will affect human reproduction. One reason why it is difficult to establish the specific effects caused by pesticides is that we are surrounded by naturally occurring sex hormones, particularly in plants. Our exposure to naturally occurring plant hormones is far greater than to synthetic ones such as pesticides – by a factor of 40 million. Nevertheless, the United States Environmental Protection Agency is developing a set of tests that will help screen pesticides for their endocrine-disrupting potential. These tests will also be adopted by other risk assessment agencies around the world, including in Australia.

The best way to manage any long-term risks of chronic pesticide effects is to reduce exposure by following all the directions on pesticide labels.

## Disposal of farm chemicals and containers

After chemicals have been applied according to the label directions, empty chemical containers and any unused chemicals must be disposed of in an environmentally responsible manner.

### drumMUSTER

drumMUSTER is a levy-based national collection and recycling scheme that funds the inspection and processing of returned chemical containers. Users deliver cleaned (triple or pressure-rinsed) containers to designated collection points where the containers are inspected and either accepted or rejected.

To locate a drumMUSTER collection site near you, check the drumMUSTER website – [www.drummuster.com.au](http://www.drummuster.com.au) – or ring the national office on (02) 6230 6712.

### Cleaning containers for collection

The personal protective equipment (PPE) specified on the label should be used when cleaning containers, as the chemical remaining in a container is the concentrate – the most toxic form of the chemical.

The best time to rinse containers is during mixing and loading, as rinsing is most effective when containers are still wet inside (dried residue is difficult to remove), and the rinsate can be emptied into the spray or mixing tank, where it can be ‘disposed of’ on the pest during treatment, avoiding the need to dispose of the residues separately (see *Disposal of rinsate or dilute chemicals* below).

**To triple-rinse** a container with a capacity of up to 20 L to meet drumMUSTER standards:

- remove the cap, invert the container and allow it to drip drain into the mixing tank for 30 seconds
- add rinse water 20% (1 L/5 L of container volume)
- replace cap and shake vigorously for 1 minute
- remove cap, invert and drip drain into mixing tank for 30 seconds
- repeat twice
- wash cap separately and replace on container.

Triple-rinsing is only suitable for small containers up to 20 L.

An alternative to manually triple-rinsing small containers is a pressure rinsing nozzle. There are two main types. One has a rotating spray head that can be used to rinse an inverted container in the induction hopper or directly over the tank. The other has a hardened, pointed shaft to pierce drums, and the hollow shaft itself has four holes at 90° to spray the water around the container.

**To pressure rinse** a container up to 20 L:

- remove the cap, invert the container and allow it to drip drain into the mixing tank for 30 seconds
- ensure clean rinse water is between 35 and 60 psi
- insert pressure-rinsing probe either through the container opening or through the pierced base of the container (depending upon the type of nozzle)
- invert container over mixing tank and rinse for 30 seconds or longer if the water coming from the container neck is not clear, moving the probe about to ensure all inner surfaces are rinsed
- wash cap in clear rinse water from container
- turn off water, remove probe and drip drain container into mixing tank for 30 seconds
- replace lid on container.

Large containers (for instance, 200 L ones) are best rinsed with a chemical transfer probe that has a flushing cycle as well as the primary suction cycle. Such probes are standard on many boom sprays and optional on most others. The drums may have to be slightly inclined to ensure all rinsate is removed. Typical rinse time for a 200 L drum would be 3 to 5 minutes.

Non-rigid containers (that is, bags and cartons) have to be buried (see *Disposal of rinsate or dilute chemicals*). Plastic bags should be rinsed first, and paper bags punctured or shredded. Cartons, too, must be punctured or shredded before burial. Burning is specifically prohibited.

### Disposal of rinsate or dilute chemicals

Labels contain a prohibition on disposing of chemicals on-site or on-farm, as does State environmental legislation. Unused chemical has first to be diluted and, if not applied in terms of the label use pattern, has to be disposed of in an environmentally responsible manner, such as in an evaporation pit.

The pit should be 1 metre deep and lined with plastic sheeting over which has been spread hydrated lime. Any wastes must be covered with at least 0.5 m of soil.

Disposal pits are suited only to small volumes and diluted chemicals. In the case of a concentrate spill, the chemical would have to be diluted to at least standard label rates before transfer to the disposal pit.

### Disposal of unwanted chemicals

ChemClear is an ongoing collection scheme for unwanted chemicals. Currently registered chemicals in original containers with identifiable labels are collected free of charge. Unregistered, unknown and unlabelled chemicals incur a fee. Collections have to be booked through the website – [www.chemclear.com.au](http://www.chemclear.com.au) – or by ringing 1800 008 182.

Occasionally, manufacturers run their own return/recall schemes. These are not covered by ChemClear, as the costs are borne by the chemical manufacturers.

# Reducing herbicide spray drift

Herbicide applicators should aim to maximise the amount of herbicide reaching the target plants and minimise drift hazard – the likelihood of the herbicide reaching off-target areas through spray drift. This results in:

1. maximum effectiveness, and
2. reduced damage to and/or contamination of off-target crops, pastures and environmental areas.

There are moral and legal responsibilities to prevent herbicides from drifting and contaminating or damaging neighbouring crops and sensitive areas. Sensitive crops may be up to 10,000 times more sensitive than the crop being sprayed. Even small quantities of drifting herbicide can cause severe damage to highly sensitive plants.

Many labels have drift reduction recommendations that must be followed. These recommendations include wind speed, temperature, droplet size and buffer zones. Look for these recommendations in the Restraints and General Instructions sections of the label.

## Types of drift

All pesticides are capable of drift. Sprayed herbicides can drift as droplets, vapours or particles.

**Droplet drift** is the easiest type of drift to control because under good spraying conditions, droplets are carried down by air turbulence and gravity and onto target plant surfaces, yet droplet drift is the most common cause of off-target damage due to applications being made under the wrong conditions.

**Particle drift** occurs when water and other herbicide carriers evaporate quickly from the droplet leaving tiny particles of concentrated herbicide. This can occur with herbicide formulations other than esters. Instances of this form of drift have damaged susceptible crops up to 30 km from the source.

**Vapour drift** is confined to volatile herbicides such as 2,4-D ester. Vapours may arise directly from the spray or evaporation of herbicide from sprayed surfaces. Use of 2,4-D ester in summer can lead to vapour drift damage of highly susceptible crops such as tomatoes, sunflowers, soybeans, cotton and grapes. This may occur hours after the herbicide has been applied.

Vapours and minute particles float in the airstream and are poorly collected on catching surfaces. They may be carried for many kilometres in thermal updraughts before being deposited.

## Other off-target movement of herbicide

Soil active or residual herbicides are also able to affect off-target plants by moving away from the original target plant in the following ways:

**Physical soil movement:** cultivating, land levelling, bulldozing, soil erosion etc. can move herbicide-treated soil.

**Underground water movement:** some herbicides are prone to leaching through the soil profile into water-tables and aquifers. Off-target plants that access water from these underground sources are therefore at risk.

**Leaking of herbicide active ingredients from treated plants roots to other non-target species:** this is called 'flash back' and is sometimes observed with picloram-based herbicides (e.g. Tordon DSH, Graxon Extra).

## Minimising spray drift

Select equipment to reduce the number of small droplets produced, being mindful that this in turn may affect coverage of the target plant, and therefore the possible effectiveness of the herbicide. This needs to be carefully considered when planning to spray, as the number of smaller droplets decreases, so does the coverage of the spray.

A good example of this is the use of air-induction nozzles that produce large droplets that splatter. These nozzles may produce a droplet pattern and number unsuitable for small targets such as seedling grasses. As the volume median diameter (see Table – Nozzle selection guide for ground application, below) of the spray becomes coarser, spray application volumes need to be increased to compensate for the fewer droplets being produced.

## Before spraying

Always check for nearby sensitive areas such as houses, schools, and riparian areas. Check for susceptible crops in the area, e.g. if using a broadleaf herbicide check for broadleaf crops such as grape vines, cotton, pulse or vegetable crops. Notify neighbours of planned herbicide treatments. Under Regulations of the *Pesticides Act 1999* it is essential that weather and other details are recorded (see Record keeping in Managing your legal responsibilities when applying pesticides).

## During spraying

- Continuously monitor meteorological conditions carefully and understand their effects on drift hazard.
- Don't spray if conditions are not suitable, and stop spraying if conditions change and become unsuitable.
- Record weather conditions (especially temperature and relative humidity), wind speed and direction, herbicide and water rates, and operating details for each paddock.
- Supervise all spraying, even when a contractor is employed. Provide a map marking the areas to be sprayed, buffers to be observed, sensitive crops and areas.
- Spray when temperatures are less than 28°C.
- Minimise spray release height (lowest possible boom height).
- Use the largest droplets that give adequate spray coverage.

- Always use the least-volatile formulation of herbicide available.
- Maintain a down-wind buffer zone (which may be in-crop e.g. keep a boom width from the downwind edge of the field).
- If sensitive crops, pastures or environmental situations are in the area, use the herbicide which is the least damaging to them.

## Spot spraying

Powered hand guns and knapsack sprayers can usually apply variable spray patterns, ranging from wide, fine spray cone patterns to coarse, thin jet streams. For most situations it is recommended to apply a moderate width cone spray pattern, in order to reduce the quantity of fine droplets produced, reducing spray drift. It is however essential to use a jet stream spray to penetrate into thick canopies of vegetation when underlying foliage requires treatment.

## Factors affecting the risk of herbicide spray drift

Any herbicide can drift. The drift hazard, or off-target potential, of a herbicide in a particular situation depends on the following factors.

### Volatility

Volatility refers to the likelihood that the herbicide will evaporate and become a gas, and the use of low volatile formulations will reduce drift hazard. Esters volatilise

(evaporate) more readily than other formulations, and many ester formulations are highly volatile when compared with the non-volatile amine, sodium salt and acid formulations. Some low volatile ester formulations may have a proportion of high volatile esters present, so caution should be exercised when using these products.

### Formulation

Formulations such as emulsifiable concentrates have a tendency to produce more small droplets than dry flowable products. Use a low volatile formulation.

### Type of adjuvant

Non-ionic surfactants and penetrants added to the spray solution produce more small droplets than oil-based adjuvants.

### Susceptible crops

Closeness of crops susceptible to the particular herbicide being applied, and their growth stage affect susceptibility. For example cotton is most sensitive to Group I herbicides in the seedling stage.

### Size of the treated area

The larger an area under treatment, the longer it takes to apply herbicide to it, and relatively large amounts of herbicide are involved. Weather conditions are more likely to change during lengthy applications, and if they do there is more herbicide available to volatilise. Applying volatile formulations to large areas increases the chances of vapour drift damage to susceptible crops and pastures.

**Table 1. Nozzle selection guide for ground application**

Drift Risk Hazard Level	High	Medium	Low
Distance downwind to susceptible crop	< 1 km	1–30 km	> 30 km
Preferred droplet size (ASAE) (to minimise risk)	Coarse	Medium	Fine
Volume median diameter (microns)	310	210	135
Pressure (bars) $\Delta$ Note: 1 bar = 100 kPa = 14.5 p.s.i.	5.0–6.5	2.0–3.5	3.5
Flat fan nozzle size (equivalent)	11008	11004	11002
Recommended nozzles (Examples only)	<b>Raindrop</b> Whirljet® Air induction Yamaha® Turbodrop® Hardi Injet® Al Teejet® Lurmark Drift-beta®	<b>Drift reduction</b> DG TeeJet® Turbo TeeJet® Hardi® ISO LD 110 Lurmark® Lo-Drift	<b>Conventional</b> XR TeeJet® Hardi® S3110 Hardi® S4110 Hardi® ISO F series Lurmark® Fan Tip
CAUTION	Can lead to poor coverage and control of grass weeds. Requires higher spray volumes.	Suitable for grass control at recommended pressures. Some fine droplets.	High proportion of 'driftable' droplets. Temperature and humidity critical.

Please note that it is recommended to apply a coarse spray quality as much as possible even if herbicide drift potential is low (drift risk hazard).

Volume Median Diameter (VMD): 50% of the droplets are less than the stated size and 50% greater.

$\Delta$  – NOTE – Refer to manufacturers' selection charts as droplet size will vary with recommended pressure. Always use the lowest pressure stated to minimise the number of fine droplets.

Adapted from P. Hughes, Department of Agriculture, Fisheries and Forestry, (DAFF), Queensland.



## Droplet capture

Targets vary in their ability to collect or capture spray droplets. Well grown, leafy crops are efficient collectors of droplets. Fallow paddocks or seedling crops are poor catching surfaces. Drift hazard is far greater when applying herbicide in these situations or adjacent to these poor capture surfaces.

The type of catching surface between the sprayed area and susceptible crops should always be considered in conjunction with the characteristics of the target area when assessing drift hazard.

## Release height of droplets

As release height of droplets is increased, the time for droplets to fall increases allowing more time for weather conditions to have an influence on the distribution of the droplets, hence increasing the potential for drift to occur. To reduce spray release height:

- operate the boom at the minimum practical height. Drift hazard doubles as nozzle height doubles. If possible, angle nozzles forward or back 30° to allow lower boom height with double overlap. Lower heights however can lead to striping as the boom sways and dips below the optimum height
- 110° nozzles produce a higher percentage of fine droplets than 80° nozzles. However they allow a lower boom height while maintaining the required double overlap, and
- operate within the pressure range recommended by the nozzle manufacturer. Production of driftable fine droplets increases as the operating pressure is increased. Lower volumes such as 30–40 L/ha produce a higher percentage of fine droplets than higher spray volumes at the same pressure and nozzle design.

## Weather conditions

Weather conditions during and shortly after application both affect drift. Influential factors include:

### Midday turbulence

Up-drafts during the heat of the day cause rapidly shifting wind directions. Spraying should stop by 11 am during summer.

### High temperatures

Avoid spraying when temperatures exceed 28°C.

### Humidity

Avoid spraying when there is low relative humidity, i.e. when Delta T (the difference between wet and dry thermometers) exceeds 10°C. Spraying when Delta T is between 8–10° is considered moderate risk. Evaporation rates under such low relative humidity conditions are high and will consequently reduce the size of smaller droplets, making them more prone to drift. Always measure temperatures and relative humidity before and during spraying and consult a Delta T chart (see page 16) to establish whether conditions are favourable. (Delta T chart stickers can be obtained from Nufarm and placed in tractors etc.)

## Wind

Avoid spraying under still (stable) conditions. Suitable wind speeds are 7–10 km/h. This is when leaves and twigs are in constant motion – a light breeze. Turbulent airflows normally carry spray droplets down into an infestation within a very short distance from the point of release.

If using low drift nozzles or higher volume applications (80–120 L/ha) wind speeds of 11–14 km/h are also suitable for spraying. In these conditions small branches move, dust is raised and loose paper is moving – a moderate breeze.

## Inversions

The most hazardous condition for creating spray drift is an atmospheric inversion, especially when combined with high humidity. Spraying should not be done while an inversion exists.

Inversions exist when temperatures increase with altitude instead of decreasing. An inversion is like a cold blanket of air above the ground, usually less than 50 m thick. Air will not rise above this blanket, and smoke, dust or fine spray droplets and particles of spray deposited within an inversion will float until the inversion breaks down.

Inversions usually occur on clear, calm mornings and nights. Windy or turbulent conditions prevent inversions from forming. Blankets of fog, dust or smoke and the tendency for sounds and smells to carry long distances indicate inversion conditions.

Smoke generators or smoky fires can be used to detect inversion conditions. Smoke will not continue to rise but will drift along at a constant height under the inversion 'blanket'.

## Night spraying

Night spraying is often undertaken because there is little wind to move pesticides off-target, and because Delta T conditions can be favourable. While the risk of spray drift is reduced at night, inversion conditions are common and have resulted in massive off-target damage in recent seasons, particularly to cotton and grapes. Night spraying is inherently high risk and should be avoided.

## Helpful meteorological information

Real time data needs to be collected in the paddock at the time of spraying. This can be done with:

- handheld units which measure temperature, Delta T and wind speed
- on-farm weather stations. Some can now be accessed by smart phones.

## Hourly data

Hourly data from Bureau of Meteorology (BOM) weather stations including temperature, Delta T, wind speed and direction is available for the previous 72 hours from: [www.bom.gov.au/weather/nsw/nsw-observations-map.shtml](http://www.bom.gov.au/weather/nsw/nsw-observations-map.shtml) – click on the relevant town.

This data can help when planning spray activities and is useful for developing an understanding of the current daily patterns of meteorological conditions.

### Meteograms™ from the BOM

Meteograms™ provide 7 day forecasts of temperature, relative humidity, rainfall, wind speed and wind direction.

Meteograms™ are very helpful in planning spray programs for periods of lowest drift risk and highest herbicide efficacy. They are available via subscription at a cost.

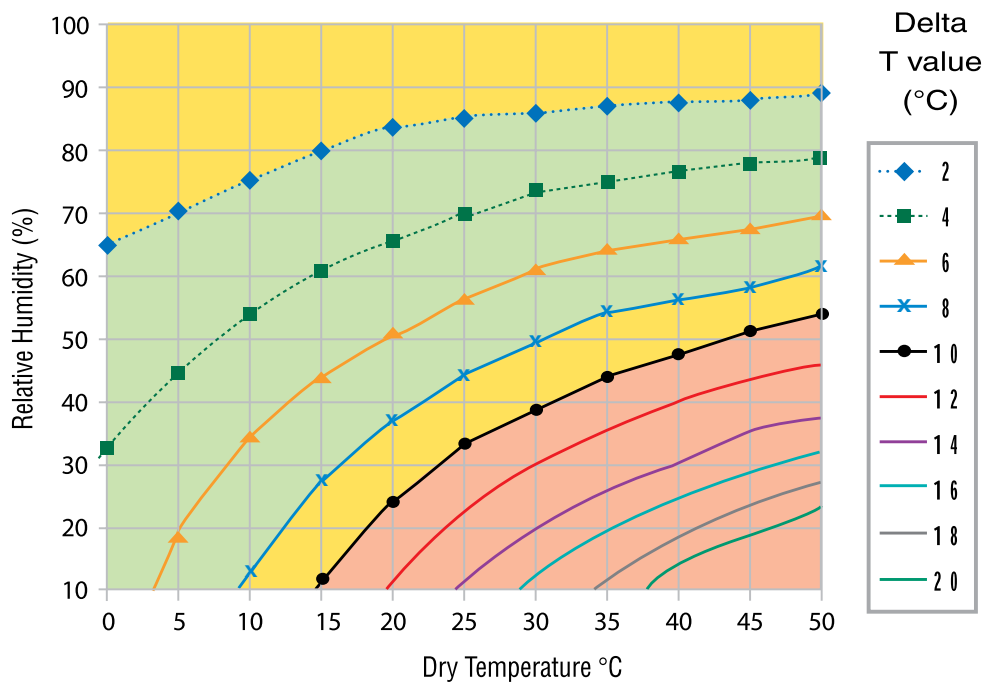
### APVMA spray drift initiative

To control spray drift, the APVMA is revising labels for boom and aerially applied pesticides to include:

- mandatory downwind buffer or no spray zones,
- specific droplet spectrum, e.g. not less than coarse droplets according to the ASAE S572 standard,
- wind speed, e.g. between 3 and 20 km/hr, and
- a prohibition on spraying if inversion conditions are present.

### SELECTING THE RIGHT DELTA T CONDITIONS FOR SPRAYING.

- preferred delta T conditions for spraying
- delta T conditions marginal
- delta T conditions unsuitable for spraying



Delta T diagram supplied by Nufarm Ltd

# Using adjuvants with herbicides

An **adjuvant** is any additive to a herbicide that is intended to improve the effectiveness of the herbicide. Some herbicides have sufficient adjuvant and require no additional adjuvant to perform well. However, some herbicides need help to spread across the leaf and penetrate the leaf surface of the target weed. The requirement of an adjuvant is usually detailed on the product label. **Always read the product label before opening the container.**

There are many adjuvants that have been developed to help herbicides to contact, remain on and penetrate the weed leaf.

The APVMA classes adjuvants into two categories;

- Adjuvants which enhance product efficacy
- Adjuvants which improve the ease of application

## Adjuvants which enhance product efficacy

### *Wetters / spreaders*

Wetters/spreaders enhance adhesion to and spreading of spray droplets on target surfaces by reducing the surface tension of the pesticide formulation and improving coverage, such as;

- Non-ionic surfactants – non-reactive, i.e. they do not have a negative charge or a positive charge; they remain on the leaf once dry and allow rewetting after rain, permitting additional pesticide uptake
- Anionic surfactants – negative charge
- Cationic surfactants – positive charge
- Amphoteric surfactants
- Organo-silicate surfactants
- Acidified surfactants

### *Stickers*

Stickers increase adhesion of pesticides to target surfaces, such as;

- Latex-based
- Terpene / pinolene
- Pyrrolidone-based

### *Penetrants*

Penetrants improve the transfer of active ingredients from the target surface to interior tissues and may include;

- Mineral oil
- Vegetable oil
- Esterified vegetable oil
- Organo-silicate surfactants
- Acidified surfactants

### *Extenders*

Extenders enhance the amount of time the active ingredient remains toxic by increasing resistance to environmental degradation, and may include;

- Ammonium sulphate
- Menthene-based

### *Humectants*

Humectants increase the density/drying time of an aqueous spray deposit, including;

- Glycerol

- Propylene glycol
- Diethyl glycol

## Adjuvants which improve ease of application

### *Acidifying/buffering agents*

Acidifying/buffering agents adjust the pH of alkaline or acidic water and minimise decomposition of the pesticide through alkaline hydrolysis.

### *Anti-foaming/de-foaming agents*

Anti-foaming/de-foaming agents reduce or suppress the formation of foam in the spray tank preventing foam overflow;

- Dimethopolysiloxane

### *Compatibility agents*

Compatibility agents permit the mixing of different agrochemicals by preventing antagonism between different ingredients in the spray solution such as;

- Ammonium sulphate

### *Drift control agents*

Drift control agents alter the viscoelastic properties of the spray solution yielding a coarser spray with greater mean droplet sizes;

- Polyacrylamides
- Polysaccharides

### *Dyes*

Dyes are commonly used for spot or boom spraying herbicides to detect missed spots or avoid spraying a plant or area twice.

### *Water conditioners*

Water conditioners prevent reaction between hard water ions in spray solutions and suppress formation of precipitates or salts;

- Ammonium sulphate

## Factors affecting adjuvant use

### *Crop safety*

Addition of an adjuvant can reduce herbicide selectivity and thereby increase crop damage. This is not an issue for fallow and pre-emergent herbicides.

### *Effectiveness or activity*

Adjuvants are usually added to increase the effectiveness of herbicides. However, using the wrong type or rate can reduce effectiveness, such as decreasing herbicide retention on leaves.

### *Water hardness*

Hard water can lead to poor mixing of the chemical with water. This particularly occurs with emulsifiable concentrates. High levels of calcium and magnesium ions bind with amine formulations, causing them to be less soluble and therefore less effective.

### *Water temperature*

Low water temperature can lead to jelling in the tank. High-concentration herbicides may not mix and surfactants may perform poorly.

# Cleaning spray equipment

The importance of cleaning and decontaminating spray equipment after herbicide applications cannot be over-stated. Crops and pastures have been severely damaged and destroyed by spray equipment that was not thoroughly cleaned before use.

Grass control herbicides (such as Verdict<sup>®</sup>, Fusilade<sup>®</sup>, Correct<sup>®</sup>, Select<sup>®</sup>, Targa<sup>®</sup> and Sertin<sup>®</sup>) have an ability to strip residues of broadleaf herbicides (particularly sulfonylurea herbicides such as Glean<sup>®</sup> and Logran<sup>®</sup>) from spray tanks and lines. These very small concentrations can be extremely damaging to winter

cereal and summer crops like canola, sunflowers, cotton, pulses and legumes and other desirable broadleaf vegetation.

Take particular care to follow the directions on the product label for cleaning and decontaminating spray equipment. Note: Rinse water should be discharged into a designated disposal area.

A number of tank and equipment cleaners are commercially available (see below).

## Cleaning and decontaminating spray equipment

Herbicide	Rate of agent/100 L water	Instructions for cleaning and decontamination
Glyphosate (Roundup <sup>®</sup> ) or Imidazolinone herbicides: imazamox (Raptor <sup>®</sup> ), imazapic (Flame <sup>®</sup> ), imazethapyr (Spinnaker <sup>®</sup> )	Clean water, (*Nufarm Tank and Equipment Cleaner)	Rinse thoroughly several times with clean water before use.
Hormone-type, salt or amine formulations: 2,4-D amine, MCPA amine, 2,4DB, dicamba	2 L household ammonia (*Nufarm Tank and Equipment Cleaner)	Thoroughly agitate and flush a small amount of solution through the system and let stand in sprayer overnight. Flush and rinse with clean water several times before use.
Hormone-type, ester formulations: 2,4-D ester, MCPA ester	500 g washing soda (crystalline sodium carbonate) + 4 L kerosene + 125 g powdered detergent (*Nufarm Tank and Equipment Cleaner)	Rinse the inside and outside of the tank and flush a small amount through the system for 15–20 minutes. Let stand for at least 2 hours or preferably overnight. Flush and rinse before use.
Triazine herbicides: atrazine, simazine	125 g powdered detergent (*Nufarm Tank and Equipment Cleaner)	Rinse with clean water before and after using the solution.
Sulfonylurea herbicides: chlorsulfuron (Glean <sup>®</sup> ), triasulfuron (Logran <sup>®</sup> ), metsulfuron (Ally <sup>®</sup> , Brushoff <sup>®</sup> )	300 mL fresh household chlorine bleach containing 4% chlorine or 300 mL BC-45 Spray Equipment Cleaning Agent (*Nufarm Tank and Equipment Cleaner)	1. Drain and flush the tank, hoses, and boom with clean water for 10 minutes. 2. Fill the tank with clean water and add the chlorine bleach. Flush the boom and allow to stand for 15 minutes, then drain. 3. Repeat Step 2. 4. Nozzles, screens and filters should be removed and cleaned separately.
Sulfonamide herbicides: flumetsulam (Broadstrike <sup>®</sup> ), metosulam (Eclipse <sup>®</sup> ) Pyridine herbicides: clopyralid (Lontrel <sup>®</sup> )	500 mL liquid detergent such as Surf <sup>®</sup> , Omo <sup>®</sup> , Dynamo Matic <sup>®</sup> or 500 g of the powder equivalent	Flush the system, then quarter-fill the tank with water and add the detergent. Start the pump and circulate for at least 15 minutes. Drain the whole system. Remove and clean the filters, screens and nozzles with clean water and allow draining.
Grass selective herbicides: haloxyfop (Verdict <sup>®</sup> ), fluazifop (Fusilade <sup>®</sup> ), clethodim (Select <sup>®</sup> ), quizalofop-p-ethyl (Targa <sup>®</sup> )	500 mL alkali liquid detergent such as Surf <sup>®</sup> , Omo <sup>®</sup> , Dynamo Matic <sup>®</sup> or 500 g of the powder equivalent	Before spraying cereals, maize, sorghum or other sensitive crops, wash the tank and rinse after use. Completely drain the tank and wash filters, screens and nozzles. Drain and repeat the procedure twice. To decontaminate, wash and rinse the system as above, quarter-fill the tank, add the detergent and circulate through the system for at least 15 minutes.  Drain the whole system. Remove filters, screens and nozzles and clean separately. Finally, flush the system with clean water and allow to drain.

# Withholding periods

The withholding period (WHP) is the minimum period of time that must elapse between:

- the last application of a chemical (herbicide) to any plant, crop, or pasture, and
- the harvesting, cutting or grazing of animals on the plant, crop or pasture; or the shearing, slaughter, collection of milk, or collection of eggs from animals grazed on the plant, crop or pasture

in order to ensure that the chemical's residues in the treated produce fall below the maximum permitted level known as the **Maximum Residue Limit** (MRL).

Observance of the withholding period stated on a registered herbicide label is a legal requirement.

To calculate the date when treated produce can be harvested or livestock slaughtered, add the WHP (for example 7 full 24-hour days) to the time when chemical application finished. For example, if chemical application finished at 11am and harvest or slaughter needs to be carried out earlier in the day than 11am, then it must wait until the next (eighth) day.

Active ingredient	Example product	Withholding period
2,2-DPA	Propon®	7 days for harvest; 2 days for grazing/foraging.
2,4-D amines & esters	Various products	7 days.
2,4-D + Picloram	Tordon® 75-D	1–8 weeks (see label).
Amitrole	Various products	Nil.
Amitrole + Ammonium thiocyanate	Amitrole T®	Nil
Atrazine	Various products	28 days.
Bromoxynil	Bromicide®	8 weeks.
Carfentrazone-ethyl	Shark™ Aquatic Herbicide	Nil.
Clopyralid	Lontrel®	1–12 weeks (see label).
Copper	Cupricide 110®	Do not treat drinking waters used by livestock grazing on heliotrope or ragwort.
Dicamba	Kamba®	7 days.
Dichlobenil	Casoron G®	Nil.
Dichlorprop	Lantana 600®	Nil.
Diquat	Reglone®	1 day in pasture, 10 days in treated water.
Flupropanate	Tussock®	Don't graze cows or goats that are being milked on treated areas. Blanket sprayed pastures – grazing or cutting for stock feed – 120 days. Spot sprayed areas – grazing or cutting for stock feed – 14 days. Don't graze stock on treated areas for 14 days prior to slaughter.
Fluroxypyr + Aminopyralid	Hot Shot™	7 days. See label for export restrictions.
Fluroxypyr	Starane™ Advanced	7 days.
Glufosinate-ammonium	Basta®	8 weeks.
Glyphosate	Roundup®	Nil.
Glyphosate + Metsulfuron-methyl	Trounce®	Nil (recommended not to graze for 7 days before treatment and for 7 days after treatment to allow adequate chemical uptake in target weeds).
Haloxypop	Verdict®	7–28 days.
Hexazinone	Velpar®	No stated withholding period.
Imazapyr + Glyphosate	Arsenal Express®	7 weeks.
Imazapyr	Various products	Do not graze or cut for stock feed.
MCPA + Dicamba	Kamba®	7 days.
MCPA	Various products	7 days.
Metsulfuron-methyl + Aminopyralid	Stinger™	3–56 days (see label).
Metsulfuron-methyl	Brush-off®	Nil (recommended not to graze for 7 days before treatment and for 7 days after treatment to allow adequate chemical uptake in target weeds).
MSMA	Armada 720 SL	5 weeks.
Orange oil	Water Clear®	Nil.
Picloram + Triclopyr + Aminopyralid	Grazon Extra®	Where product is used to control woody weeds in pastures there is a restriction of 12 weeks for use of treated pastures for making hay and silage; using hay or other plant material for compost, mulch or mushroom substrate; or using animal waste from animals grazing on treated pastures for compost, mulching, or spreading on pasture/crops.
Picloram	Vigilant II®	Nil.
Tebuthiuron	Graslan®	Nil.
Triclopyr + Picloram	Tordon® DSH	Nil.
Triclopyr	Garlon®	Nil.

# Herbicide resistance

Herbicide resistance is the inherent ability of a weed to survive treatment with a herbicide that would normally kill it. If a resistant plant is allowed to reproduce, the resistance spreads resulting in more and more plants that are resistant to that particular herbicide. This is not the same as poor herbicide performance. Once herbicide resistance occurs it will persist indefinitely.

Herbicides act by interfering with specific processes in plants, known as the herbicide's mode of action. Different herbicides may have the same mode of action and herbicides with the same modes of action are grouped from Group A to Group Z (see below). The risk of herbicide resistance developing is higher in certain Groups. For example, Groups A and B are more likely to develop resistance than Groups I, L and M.

The best way to manage herbicide resistance is to adopt integrated weed management by combining herbicide use with non-chemical control options (as described in *Integrated weed management*), as well as:

- ensuring any resistant plants do not set seed;
- regularly monitoring the results of herbicide treatments and looking out for resistant plants;
- undertaking herbicide resistance testing on suspect plants that survive herbicide treatments; and
- not relying on the same herbicide Group for regular weed control (rotate treatments using herbicides from different Groups).

Herbicide Group	Risk	Active ingredient	Example product	Mode of Action
A	High	Haloxyfop	Verdict®	Inhibitors of fat synthesis (ACCase [acetyl coA carboxylase] inhibitors)
B	High	Metsulfuron-methyl	Various products	Inhibitors of acetolactate synthase (ALS inhibitors)
B	High	Imazapyr	Various products	Inhibitors of acetolactate synthase (ALS inhibitors)
B	High	Metsulfuron-methyl	Brush-off®	Inhibitors of acetolactate synthase (ALS inhibitors)
B + I	High + Moderate	Metsulfuron-methyl + Aminopyralid	Stinger™	Inhibitors of acetolactate synthase (ALS inhibitors) + Disruptors of plant cell growth (Synthetic auxins)
B + M	High + Moderate	Metsulfuron-methyl + Glyphosate	Cut-out®	Inhibitors of acetolactate synthase (ALS inhibitors) + Inhibitors of EPSP synthase
B + M	High + Moderate	Imazapyr + Glyphosate	Arsenal Express®	Inhibitors of acetolactate synthase (ALS inhibitors) + Inhibitors of EPSP synthase
C	Moderate	Atrazine	Various products	Inhibitors of photosynthesis at photosystem II (PS II inhibitors)
C	Moderate	Bromoxynil	Bromicide®	Inhibitors of photosynthesis at photosystem II (PS II inhibitors)
C	Moderate	Hexazinone	Velpar®	Inhibitors of photosynthesis at photosystem II (PS II inhibitors)
C	Moderate	Tebuthiuron	Graslan®	Inhibitors of photosynthesis at photosystem II (PS II inhibitors)
G	Moderate	Carfentrazone-ethyl	Shark™ Aquatic Herbicide	Inhibitors of protoporphyrinogen oxidase (PPOs)
I	Moderate	2,4-D amine and ester	Various products	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Clopyralid	Lontrel®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Dicamba	Kamba®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Dichlorprop	Lantana 600®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Fluroxypyr	Starane™	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Fluroxypyr + Aminopyralid	Hot Shot™	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	MCPA	Various products	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	MCPA + Dicamba	Kamba®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Picloram	Vigilant II®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Picloram + Triclopyr + Aminopyralid	Grazon Extra®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Triclopyr	Garlon®	Disruptors of plant cell growth (Synthetic auxins)
I	Moderate	Triclopyr + Picloram	Tordon® DSH	Disruptors of plant cell growth (Synthetic auxins)
J	Moderate	Flupropanate	Tussock®	Inhibitors of fat synthesis (Not ACCase inhibitors)
J	Moderate	2,2-DPA	Propon®	Inhibitors of fat synthesis (Not ACCase inhibitors)
L	Moderate	Diquat	Reglone®	Inhibitors of photosynthesis at photosystem I (PSI inhibitors)
M	Moderate	Glyphosate	Roundup®	Inhibitors of EPSP synthase
N	Moderate	Glufosinate-ammonium	Basta®	Inhibitors of glutamine synthetase
O	Moderate	Dichlobenil	Casoron G®	Inhibitors of cell wall (cellulose) synthesis
Q	Moderate	Amitrole + Ammonium thiocyanate	Various products	Bleachers: Inhibitors of carotenoid biosynthesis unknown target
Z	Moderate	MSMA	Armada 720 SL	Herbicides with unknown and probably diverse sites of action

# Control techniques using herbicides

Herbicides are commonly used for controlling weeds in agricultural and non-agricultural situations, and there are many types of equipment and techniques available for applying them. The appropriate option will be determined by the size of the infestation, the available resources, access and personal preferences. The most commonly used application techniques are listed and described below. Always remember to read the product label and any relevant permit before using a herbicide.

## Foliar spraying

Foliar spraying is the use of herbicide diluted with water at a specific rate, and sprayed over the foliage to the point of runoff (until every leaf is wetted, but not dripping).

It is suitable for shrubs, grasses and dense vines where complete coverage can be achieved. Advantages include speed of application and economy. Disadvantages include the potential for spray drift and off-target damage.

Foliar spraying can be done a number of ways, depending on the size of the weed plant and/or the infestation. Blanket spraying using a boom spray mounted on a vehicle can be used to treat large areas with infestations up to 1 m in height. Taller infestations or those with difficult access can be sprayed with a handgun connected by a hose to a herbicide tank and pump, carried by a tractor or vehicle. Smaller infestations can be sprayed using a backpack/knapsack spray unit. Spot spraying is treating individual weed plants, areas that have only small clumps of weed infestations, or regrowth areas.

## Gas gun/splatter gun

Gas guns or splatter guns apply a low volume of high concentration, translocatable herbicide to the foliage of an infestation (generally woody weeds). The herbicide is squirted from a gas-powered gun, placing very large droplets onto the leaves from 6–10 m away. The splatter is arched over the tops



Figure 1: Foliar spraying using a knapsack.

of bushes and down their sides, at specific intervals (refer to product labels for exact rates). Only a small portion of the foliage needs to be treated minimising off-target damage and reducing chemical usage. This technique allows for specific targeting of the herbicide and a marker dye is necessary to identify treated areas.

## Rope/wick applicators

A wick or rope is soaked in herbicide that is pumped from a reservoir (either by hand or with 12-volt equipment). The wetted wick is used to wipe or brush herbicide over the weeds. Commercially available equipment such as Weed Wand and Weed Wiper are available in sizes ranging from hand-held to vehicle- or tractor-mounted.

It is sometimes necessary to provide some resistance for the wiper when the weed leaf or stem is soft. Stem swiping involves using a knife to provide resistance down the back of the stem or leaf, while manually wiping herbicide down the front.

## Basal bark spraying

An oil-soluble herbicide is mixed with diesel and sprayed around the full circumference of the trunk or stem of the plant. It works for plants with basal diameters up to 10 cm and heights of 30 to 100 cm (check herbicide product labels as some plants can only be treated if their basal diameter is less than 5 cm). The diesel helps move the herbicide through the bark and into the underground storage organs of the plant, slowly killing it.

The whole circumference of the stem or trunk must be sprayed or painted with herbicide solution from ground level to a height of 30 cm. It is important to saturate the full circumference of the trunk, and to treat every stem or trunk arising from the ground.

Basal bark spraying is suitable for thin-barked woody weeds and undesirable trees, and is also an effective way to treat saplings, regrowth and multi-stemmed shrubs and weeds in inaccessible areas such as steep banks. It creates little or no spray drift or off-target damage, and will usually control difficult-to-kill weeds at any time of the year, as long as the bark is not wet or too thick for the diesel to penetrate.

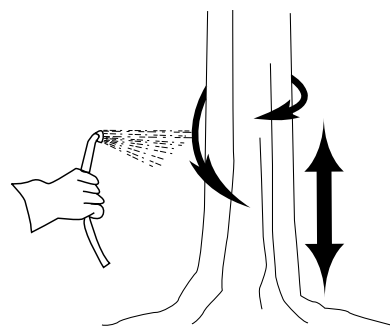


Figure 2: Basal bark application.

## Stem injection methods

Herbicide is placed immediately into holes or cuts made by drilling or cutting through the bark into the sapwood tissue in the trunks of woody weeds and trees. The aim is to reach the sapwood layer just under the bark (the cambium), where the chemical will be transported throughout the plant.

It is essential to apply the herbicide immediately (within 15 seconds of drilling the hole or cutting the trunk), as stem injection relies on the active uptake and growth of the plant to move the chemical through its tissues.

Stem injection methods kill the tree or shrub where it stands, and only trees and shrubs that can be safely left to die and rot should be treated this way. If the tree or shrub is to be felled, allow it to die completely before felling.

### Stem injection – drill and fill method

This method is for trees and woody weeds with stems or trunks greater than 5 cm in circumference. A battery-powered drill is used to make downward-angled holes in the sapwood approximately 5 cm apart. Herbicide is then injected in measured doses using a backpack reservoir and syringe.

### Stem injection – axe cut method

The axe cut method can be used for trees and woody weeds with stems or trunks greater than 5 cm in circumference. Using an axe or tomahawk, horizontal cuts are made into the sapwood around the circumference of the trunk at waist height. While still in the cut, the axe or tomahawk is leaned out to make a downward angled pocket, which will allow herbicide to pool. The herbicide is then immediately injected into the pocket. Cuts should be made no farther than 3 cm apart. This method is also referred to as frilling or chipping.

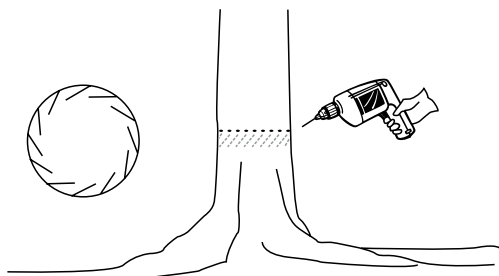


Figure 3: Stem injection, drill and fill method.

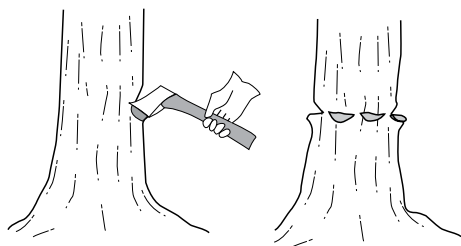


Figure 4: Stem injection, axe cut method.

It is important not to entirely ringbark the trunk, as this will decrease the uptake of the herbicide into the plant.

### Tree spearing

Tree spearing is an alternative stem injection method to the use of an axe or drill. The method uses a specifically designed tree spear and technique. The spear is thrust into the tree at an angle of 30° to 40° from the vertical, opening a cut in the tree and applying the appropriate herbicide amount. The process is repeated, forming a row of cuts approximately 50 mm apart.

### Cut stump

Here the plant is cut off completely at its base (no higher than 15 cm from the ground) using a chainsaw, axe, brushcutter or machete (depending on the thickness of the stem/trunk). Herbicide is then sprayed, squirted or painted on to the exposed surface of the cut stump emerging from the ground, killing the stump and the root system.

It is imperative that the herbicide solution is applied as soon as the trunk or stem is cut. A delay of more than 15 seconds between cutting and applying the chemical will give poor results. Two operators working as a team can use this method effectively. The herbicide can be applied from a knapsack, or with a paintbrush, drench gun or a hand spray bottle. A

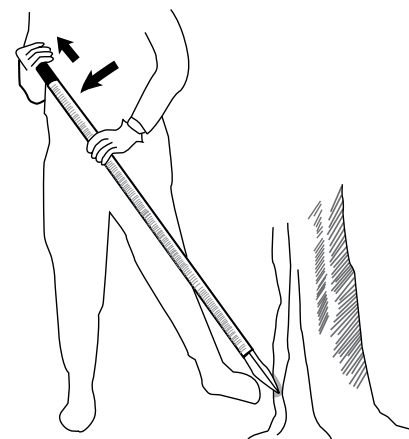
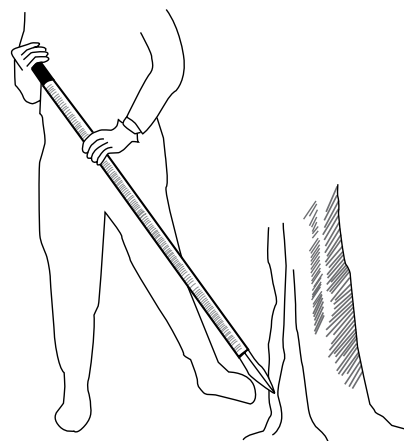


Figure 5: Stem injection, tree spearing.



coloured dye should be used in the solution to mark the stumps that have been treated.

This method has the appeal of removing the weed immediately, and is used mainly for trees and woody weeds.

### Cut and swab

This method is similar to the cut stump method, but is suited to vines and multi-stemmed shrubs. Here, the plant stems are cut through completely, close to the ground. Herbicide is then applied immediately to the cut surface emerging from the ground, via spray or brush application.

In the case of Madeira vine and some other vines with aerial tubers, both ends of the cut stems must be treated with herbicide.

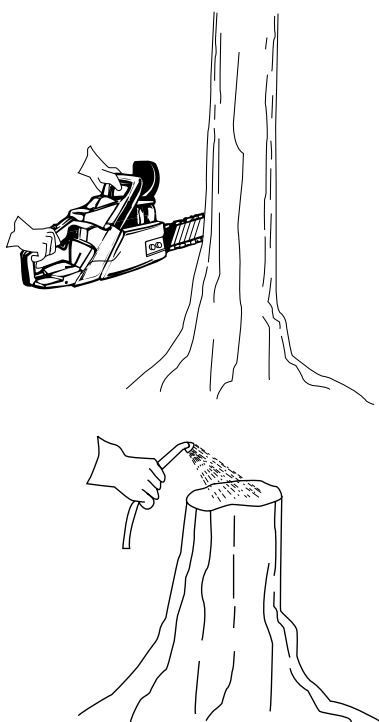


Figure 6: Cut stump method.

### Stem-scraping

This method is also called bark-stripping or stem-painting. Stem-scraping is used for plants and vines with aerial tubers. A sharp knife is used to scrape a very thin layer of bark from a 15–30 cm section of the stem. Herbicide is then immediately applied to the exposed soft underlying green tissue. In the case of Madeira vine, all tubers within reach should be collected, removed and composted or destroyed before starting the scraping.

With some woody weeds the bark can be peeled away and the exposed wood painted or sprayed with herbicide.

*Line Drawings by Lyn Skillings.*

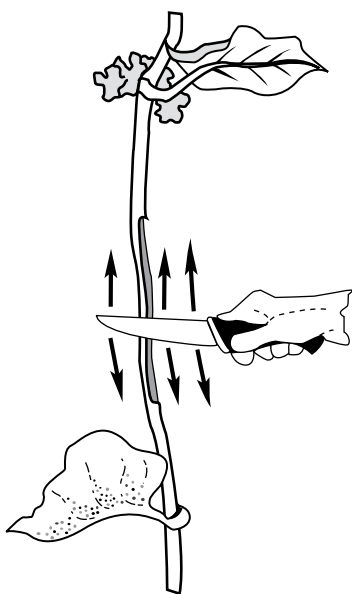


Figure 7a: Stem scrape method. A sharp knife is used to scrape the bark.

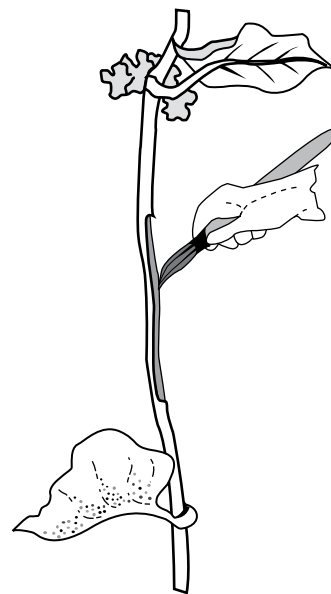


Figure 7b: Stem scrape method. Herbicide is applied to the green tissue.

# Weeds declared noxious in New South Wales

The following weeds are currently declared noxious in New South Wales under the *Noxious Weeds Act 1993*, as gazetted by Weed Control Order 2014.

Noxious weeds are divided into five Classes. To find the noxious weed and its control class for your Local Control Authority area go to [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds) or download the NSW WeedWise mobile app.

## Schedule of Noxious Weeds

Common name	Scientific name	Control Class	Common name	Scientific name	Control Class
African boxthorn	<i>Lycium ferocissimum</i>	C3, C4	Burr ragweed	<i>Ambrosia confertiflora</i>	C5
African feather grass	<i>Pennisetum macrourum</i>	C5	Burrs	<i>Xanthium</i> species	C4
African lovegrass	<i>Eragrostis curvula</i>	C4	Cabomba	<i>Cabomba</i> species	C5
African olive	<i>Olea europaea</i> subsp. <i>cuspidata</i>	C3, C4	Californian burr	<i>Xanthium orientale</i>	C4
African turnip weed – runcinatum	<i>Sisymbrium runcinatum</i>	C5	Camel thorn	<i>Alhagi maurorum</i>	C4
African turnip weed – thellungii	<i>Sisymbrium thellungii</i>	C5	Camphor laurel	<i>Cinnamomum camphora</i>	C3, C4
Aleman grass	<i>Echinochloa polystachya</i>	C2	Cane needle grass	<i>Nassella hyalina</i>	C3
Alligator weed	<i>Alternanthera philoxeroides</i>	C2, C3	Cape broom	<i>Genista monspessulana</i>	C2, C3, C4
Anchored water hyacinth	<i>Eichhornia azurea</i>	C1	Cape ivy	<i>Delairea odorata</i>	C3
Annual ragweed	<i>Ambrosia artemisiifolia</i>	C5	Cape tulip	<i>Moraea</i> species	C4
Arrowhead	<i>Sagittaria montevidensis</i>	C4	Cassia	<i>Senna pendula</i> var. <i>glabrata</i>	C3, C4
Artichoke thistle	<i>Cynara cardunculus</i>	C5	Castor oil plant	<i>Ricinus communis</i>	C3, C4
Arum lily	<i>Zantedeschia aethiopica</i>	C4	Cat's claw creeper	<i>Dolichandra unguis-cati</i>	C2, C3, C4
Arundinaria reed	<i>Arundinaria</i> species	C3	Cayenne snakeweed	<i>Stachytarpheta cayennensis</i>	C5
Asparagus fern	<i>Asparagus virgatus</i>	C2	Cecropia	<i>Cecropia</i> species	C2
Asparagus weeds	<i>Asparagus</i> species	C4	Cherry guava	<i>Psidium cattleianum</i>	C3
Athel pine	<i>Tamarix aphylla</i>	C4, C5	Chilean needle grass	<i>Nassella neesiana</i>	C2, C3, C4
Balloon vine	<i>Cardiospermum grandiflorum</i>	C4	Chinese celtis	<i>Celtis sinensis</i>	C2, C3, C4
Bathurst burr	<i>Xanthium spinosum</i>	C4	Chinese tallow tree	<i>Triadica sebifera</i>	C2, C3
Bear-skin fescue	<i>Festuca gautieri</i>	C5	Chinese violet	<i>Asystasia gangetica</i> subsp. <i>micrantha</i>	C1
Bellyache bush	<i>Jatropha gossypifolia</i>	C2	Cineraria	<i>Cineraria lyratiformis</i>	C4
Bitou bush	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	C2, C3, C4	Climbing asparagus	<i>Asparagus africanus</i>	C2
Black knapweed	<i>Centaurea nigra</i>	C1	Climbing asparagus fern	<i>Asparagus plumosus</i>	C3, C4
Black locust	<i>Robinia pseudoacacia</i>	C3	Clockweed	<i>Gaura parviflora</i>	C5
Black willow	<i>Salix nigra</i>	C2, C3, C4	Coastal teatree	<i>Leptospermum laevigatum</i>	C3
Blackberry	<i>Rubus fruticosus</i> species aggregate	C4	Cockspur coral tree	<i>Erythrina crista-galli</i>	C3, C4
Blue heliotrope	<i>Heliotropium amplexicaule</i>	C2, C3, C4	Cocos palm	<i>Syagrus romanzoffiana</i>	C3
Blue hound's tongue	<i>Cynoglossum creticum</i>	C2	Columbus grass	<i>Sorghum x alnum</i>	C4
Blue passionflower	<i>Passiflora caerulea</i>	C3	Common pest pears	<i>Opuntia</i> species	C3, C4
Blue periwinkle	<i>Vinca major</i>	C3	Common thornapple	<i>Datura stramonium</i>	C3
Boneseed	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	C1	Coolatai grass	<i>Hyparrhenia hirta</i>	C3, C4
Bower vine	<i>Pandorea jasminoides</i>	C3	Corky passionfruit	<i>Passiflora suberosa</i>	C4
Bridal creeper	<i>Asparagus asparagoides</i>	C3, C4	Corn sowthistle	<i>Sonchus arvensis</i>	C5
Bridal veil creeper	<i>Asparagus declinatus</i>	C1	Cotoneaster	<i>Cotoneaster glaucophyllus</i>	C3
Broad-leaf pepper tree	<i>Schinus terebinthifolius</i>	C2, C3	Creeping knapweed	<i>Rhaponticum repens</i>	C4
Broomrapes	<i>Orobancha</i> species	C1	Creeping lantana	<i>Lantana montevidensis</i>	C2, C3, C4
Brush cherry	<i>Syzygium paniculatum</i>	C3	Crofton weed	<i>Ageratina adenophora</i>	C3, C4
Buffalo burr	<i>Solanum rostratum</i>	C3, C4	Dipogon	<i>Dipogon lignosus</i>	C4
			Dodder	<i>Cuscuta</i> species	C5
			East Indian hygrophila	<i>Hygrophila polysperma</i>	C3, C4
			Espartillo – broad kernel	<i>Amelichloa caudata</i>	C5
			Espartillo – narrow kernel	<i>Amelichloa brachychaeta</i>	C5

Common name	Scientific name	Control Class
Eurasian water milfoil	<i>Myriophyllum spicatum</i>	C1
European hackberry	<i>Celtis australis</i>	C4
Fine-bristled burr grass	<i>Cenchrus brownii</i>	C5
Fireweed	<i>Senecio madagascariensis</i>	C3, C4
Flame tree	<i>Brachychiton acerifolius</i>	C3
Flax-leaf broom	<i>Genista linifolia</i>	C3, C4
Fountain grass	<i>Pennisetum setaceum</i>	C5
Freckle face	<i>Hypoestes phyllostachya</i>	C3
Frogbit	<i>Limnobium laevigatum</i>	C1
Galenia	<i>Galenia pubescens</i>	C4
Gallon's curse	<i>Cenchrus biflorus</i>	C5
Galvanised burr	<i>Sclerolaena birchii</i>	C4
Gamba grass	<i>Andropogon gayanus</i>	C5
Giant devil's fig	<i>Solanum chrysotrichum</i>	C3
Giant Parramatta grass	<i>Sporobolus fertilis</i>	C3, C4
Giant rat's tail grass	<i>Sporobolus pyramidalis</i>	C2, C3
Giant reed	<i>Arundo donax</i>	C3, C4
Ginger lily	<i>Hedychium gardnerianum</i>	C2, C3
Glaucous starthistle	<i>Carthamus leucocaulos</i>	C5
Glory lily	<i>Gloriosa superba</i>	C3
Golden dodder	<i>Cuscuta campestris</i>	C4
Golden thistle	<i>Scolymus hispanicus</i>	C5
Goldflower	<i>Hypericum kouytchense</i>	C3
Gorse	<i>Ulex europaeus</i>	C2, C3
Green cestrum	<i>Cestrum parqui</i>	C3
Grey sallow	<i>Salix cinerea</i>	C2, C3, C4
Ground asparagus	<i>Asparagus aethiopicus</i>	C3, C4
Groundsel bush	<i>Baccharis halimifolia</i>	C2, C3
Harrisia cactus	<i>Harrisia species</i>	C3, C4
Hawkweeds	<i>Hieracium species</i>	C1
Hemlock	<i>Conium maculatum</i>	C4
Hoary cress	<i>Lepidium draba</i>	C4
Holly fern	<i>Cyrtomium falcatum</i>	C4
Honey locust	<i>Gleditsia triacanthos</i>	C3, C4
Horehound	<i>Marrubium vulgare</i>	C4
Horsetails	<i>Equisetum species</i>	C1
Hudson pear	<i>Cylindropuntia rosea</i>	C4
Hydrocotyl	<i>Hydrocotyl ranunculoides</i>	C1
Hygrophila	<i>Hygrophila costata</i>	C2
Hymenachne	<i>Hymenachne amplexicaulis</i> and hybrids	C1
Illyrian thistle	<i>Onopordum illyricum</i>	C3, C4
Indian fig	<i>Opuntia ficus-indicus</i>	C4
Indian hawthorn	<i>Rhaphiolepis indica</i>	C4
Italian bugloss	<i>Echium italicum</i>	C4
Italian cockleburr	<i>Xanthium italicum</i>	C4
Japanese honeysuckle	<i>Lonicera japonica</i>	C3, C4
Jasmine	<i>Jasminum polyanthum</i>	C4
Johnson grass	<i>Sorghum halepense</i>	C4
Karoo thorn	<i>Acacia karroo</i>	C1
Kidney-leaf mud plantain	<i>Heteranthera reniformis</i>	C1
King orchid	<i>Dendrobium speciosum</i>	C3
Kochia	<i>Bassia scoparia</i>	C1
Koster's curse	<i>Clidemia hirta</i>	C1

Common name	Scientific name	Control Class
Kudzu	<i>Pueraria lobata</i>	C2, C3
Lacy ragweed	<i>Ambrosia tenuifolia</i>	C4
Lady-of-the-night	<i>Cestrum nocturnum</i>	C4
Lagarosiphon	<i>Lagarosiphon major</i>	C1
Lantana	<i>Lantana species</i>	C2, C3, C4
Leaf cactus	<i>Pereskia aculeata</i>	C2
Leafy elodea	<i>Egeria densa</i>	C4
Lilly pillly – blue	<i>Syzygium oleosum</i>	C3
Lilly pillly – broad-leaved	<i>Acmena hemilampra</i>	C3
Lilly pillly – small-leaved	<i>Acmena smithii</i>	C3
Lippia	<i>Phyla canescens</i>	C4
Long-leaf willow primrose	<i>Ludwigia longifolia</i>	C2, C3, C4
Ludwigia	<i>Ludwigia peruviana</i>	C2, C3
Madeira vine	<i>Anredera cordifolia</i>	C2, C3, C4
Mahonia	<i>Berberis lomariifolia</i>	C3
Mesquite	<i>Prosopis species</i>	C2, C3
Mexican feather grass	<i>Nassella tenuissima</i>	C1
Mexican poppy	<i>Argemone mexicana</i>	C5
Miconia	<i>Miconia species</i>	C1
Mikania vine	<i>Mikania micrantha</i>	C1
Mimosa	<i>Mimosa pigra</i>	C1
Ming asparagus fern	<i>Asparagus macowanii</i> var. <i>zuluensis</i>	C2
Mirror bush	<i>Coprosma repens</i>	C2
Mistflower	<i>Ageratina riparia</i>	C4
Monkey's comb	<i>Pithecoctenium crucigerum</i>	C4
Montbretia	<i>Crocasmia x crocosmiiflora</i>	C4
Morning glory – coastal	<i>Ipomoea cairica</i>	C4
Morning glory – common	<i>Ipomoea purpurea</i>	C3
Morning glory – purple	<i>Ipomoea indica</i>	C3, C4
Mossman River grass	<i>Cenchrus echinatus</i>	C5
Moth vine	<i>Araujia sericifera</i>	C4
Mother-of-millions	<i>Bryophyllum</i> spp.	C3, C4
Murraya	<i>Murraya paniculata</i>	C3
Mysore thorn	<i>Caesalpinia decapetala</i>	C3
Native frangipani	<i>Hymenosporum flavum</i>	C3
Nodding thistle	<i>Carduus nutans</i>	C3, C4
Noogoora burr	<i>Xanthium occidentale</i>	C4
Ochna	<i>Ochna serrulata</i>	C3, C4
Palm grass	<i>Cortaderia species</i>	C3
Pampas grass	<i>Cortaderia species</i>	C3, C4
Paper mulberry	<i>Broussonetia papyrifera</i>	C2
Parkinsonia	<i>Parkinsonia aculeata</i>	C2
Parthenium weed	<i>Parthenium hysterophorus</i>	C1
Paterson's curse	<i>Echium plantagineum</i>	C4
Perennial ground cherry	<i>Physalis virginiana</i>	C3, C4
Perennial thistle	<i>Cirsium arvense</i>	C3
Pond apple	<i>Annona glabra</i>	C1
Prairie ground cherry	<i>Physalis hederifolia</i>	C3, C4
Prickly acacia	<i>Acacia nilotica</i>	C1
Prickly pear	<i>Opuntia stricta</i>	C3, C4
Privet – broad-leaf	<i>Ligustrum lucidum</i>	C2, C4
Privet – European	<i>Ligustrum vulgare</i>	C4
Privet – narrow-leaf	<i>Ligustrum sinense</i>	C2, C4

Common name	Scientific name	Control Class	Common name	Scientific name	Control Class
Ragwort	<i>Senecio jacobaea</i>	C4	Spotted knapweed	<i>Centaurea stoebe subsp. micranthos</i>	C1
Rattlepod	<i>Crotalaria lunata</i>	C3	St. Barnaby's thistle	<i>Centaurea solstitialis</i>	C4
Red cedar	<i>Toona ciliata</i>	C3	St. John's wort	<i>Hypericum perforatum</i>	C3, C4
Red rice	<i>Oryza rufipogon</i>	C5	Staghorn fern	<i>Platycerium superbum</i>	C3
Rhizomatous bamboo	<i>Phyllostachys species</i>	C3, C4	Star thistle	<i>Centaurea calcitrapa</i>	C4
Rhus tree	<i>Toxicodendron succedaneum</i>	C4	Stemless thistle	<i>Onopurdum acaulon</i>	C3, C4
Rice paper plant	<i>Tetrapanax papyrifer</i>	C3	Sweet briar	<i>Rosa rubiginosa</i>	C4
Rubber vine	<i>Cryptostegia grandiflora</i>	C1	Sweet pittosporum	<i>Pittosporum undulatum</i>	C3
Sagittaria	<i>Sagittaria platyphylla</i>	C4	Taurian thistle	<i>Onopurdum tauricum</i>	C3, C4
Salvinia	<i>Salvinia molesta</i>	C2, C3, C4	Texas blueweed	<i>Helianthus ciliaris</i>	C5
Scotch broom	<i>Cytisus scoparius</i>	C3, C4	Tiger pear	<i>Opuntia aurantiaca</i>	C3, C4
Scotch thistle	<i>Onopordum acanthium</i>	C3, C4	Tree pear	<i>Opuntia tomentosa</i>	C3, C4
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	C1	Tree-of-heaven	<i>Ailanthus altissima</i>	C4
Serrated tussock	<i>Nassella trichotoma</i>	C2, C3, C4	Tropical soda apple	<i>Solanum viarum</i>	C1
Siam weed	<i>Chromolaena odorata</i>	C1	Turkey rhubarb	<i>Acetosa sagittata</i>	C4
Sicklethorn	<i>Asparagus falcatus</i>	C2	Tussock paspalum	<i>Paspalum quadrifarium</i>	C4
Silk forage sorghum	<i>Sorghum hybrid cultivar 'Silk'</i>	C4	Tutsan	<i>Hypericum androsaemum</i>	C3
Silky oak	<i>Grevillea robusta</i>	C3	Umbrella tree	<i>Schefflera actinophylla</i>	C3
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	C3, C4	Viper's bugloss	<i>Echium vulgare</i>	C4
Singapore daisy	<i>Wedelia trilobata</i>	C2	Water caltrop	<i>Trapa species</i>	C1
Siratro	<i>Macroptilium atropurpureum</i>	C3	Water hyacinth	<i>Eichhornia crassipes</i>	C2, C3, C4
Smooth tree pear	<i>Opuntia vulgaris</i>	C3, C4	Water lettuce	<i>Pistia stratiotes</i>	C1
Smooth-stemmed turnip	<i>Brassica barrelieri subsp. oxyrrhina</i>	C5	Water soldier	<i>Stratiotes aloides</i>	C1
Soldier thistle	<i>Picnoman acarna</i>	C5	Water star grass	<i>Heteranthera zosterifolia</i>	C4
South American burr	<i>Xanthium cavanillesii</i>	C4	White blackberry	<i>Rubus niveus</i>	C3
Spanish broom	<i>Spartium junceum</i>	C3	White cedar	<i>Melia azedarach</i>	C4
Spanish moss	<i>Tillandsia usneoides</i>	C2	Wild radish	<i>Raphanus raphanistrum</i>	C4
Spiny burrgrass – incertus	<i>Cenchrus spinifex</i>	C4	Willows	<i>Salix species</i>	C3, C4
Spiny burrgrass – longispinus	<i>Cenchrus longispinus</i>	C4	Winter senna	<i>Senna septemtrionalis</i>	C3
Spiny emex	<i>Emex australis</i>	C4	Witchweeds	<i>Striga species</i>	C1
Spongeplant	<i>Limnobia spongia</i>	C1	Yellow bells	<i>Tecoma stans</i>	C2, C3, C4
Spotted golden thistle	<i>Scolymus maculatus</i>	C4	Yellow burrhead	<i>Limnocharis flava</i>	C1
			Yellow nutgrass	<i>Cyperus esculentus</i>	C5

## Weed control classes

The following control requirements exist for the five Control Classes applied to plants under the *Noxious Weeds Act 1993* (NSW):

Control Class	Weed type	Example control requirements
Class 1 State Prohibited Weed	Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also 'notifiable' and a range of restrictions on their sale and movement exist.
Class 2 Regionally Prohibited Weed	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also 'notifiable' and a range of restrictions on their sale and movement exist.
Class 3 Regionally Controlled Weed	Plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be fully and continuously suppressed and destroyed.*
Class 4 Locally Controlled Weed	Plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	The growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction.*
Class 5 Restricted Plant	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.	The requirements in the <i>Noxious Weeds Act 1993</i> for a notifiable weed must be complied with.

\* In some cases there are further control requirements in this Class, such as 'the plant may not be sold, propagated or knowingly distributed'. See [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds) for details.

All Class 1, 2 and 5 weeds are notifiable weeds. All outbreaks of these weeds must be reported to the local control authority within 24 hours of discovery. They are also prohibited from sale or purchase in any area of NSW.

# Minor-use permits

Minor-use permits allow for an 'off-label' use of a registered herbicide. The Australian Pesticides & Veterinary Medicines Authority (APVMA) issues permits based on careful decisions about the stability and efficacy of a herbicide product for a particular use and the extent to which use of the product might pose economic, environmental or social risks.

Permit	Expiry date	Weed	Active ingredient
PER9792	30/11/2015	African lovegrass	Flupropanate
		Chilean needle grass	Glyphosate
PER9907	31/03/2020	Cherry guava	Fluroxypyr
		African boxthorn	Glyphosate
		Asparagus fern	Metsulfuron-methyl
PER10461	31/01/2016	Salvinia	Glyphosate
PER10462	31/01/2016	Fireweed	2,4-D amine
PER10615	31/03/2020	Camphor laurel	Glyphosate
PER11427	30/06/2019	Green cestrum	Triclopyr
PER11604	30/06/2019	Kudzu	Metsulfuron-methyl Triclopyr + Picloram
PER11737	31/03/2017	Alligator weed	Imazapyr
PER11788	31/03/2015	African olive	Triclopyr
PER11856	30/06/2017	Sagittaria	Glyphosate
PER12251	31/12/2015	Bitou bush	Metsulfuron-methyl
PER12362	30/11/2015	Khaki weed	Triclopyr + Picloram
PER12367	3/10/2015	Cockspur coral tree	Picloram + Triclopyr + Aminopyralid Triclopyr + Picloram
PER12942	30/06/2017	Giant devil's fig	Glyphosate
		Tropical soda apple	Picloram + Triclopyr + Aminopyralid Triclopyr + Picloram
PER100146	30/09/2017	Fireweed	Metsulfuron-methyl
PER13678	30/09/2017	Chinese violet	MCPA + Dicamba
PER13891	31/03/2023	Mimosa bush	Tebuthiuron
PER13914	31/03/2016	Madeira vine/ Cat's claw creeper	Triclopyr + Picloram
PER13917	31/03/2020	Horsetails	Dichlobenil
PER13921	30/06/2017	Hymenachne	Glyphosate

Before using a chemical product under a permit issued by the APVMA, users must obtain a copy and read the permit and all details, conditions and limitations relevant to that permit, and must comply with the details, conditions and limitations prior to use.

The following list comprises permits mentioned in this publication.

Permit	Expiry date	Weed	Active ingredient
PER14197	31/07/2018	Lippia	2,4-D amine
PER14200	30/06/2018	Alligator weed	Metsulfuron-methyl
PER14283	30/06/2015	Hymenachne	Haloxypop
PER14301	30/09/2016	Hawkweeds	Picloram
PER14302	30/09/2018	Bamboo	Flupropanate
PER14327	30/06/2017	Salvinia	Glyphosate
PER14442	30/06/2018	All species of the cactaceae family	Picloram + Triclopyr + Aminopyralid Triclopyr + Picloram Triclopyr
PER14447	31/03/2017	Salvinia	Metsulfuron-methyl
PER14549	30/06/2018	Sagittaria	Glyphosate
PER14553	30/06/2017	Harrisia cactus	Amitrole Metsulfuron methyl Triclopyr + Picloram + Aminopyralid
PER14558	30/06/2024	Hawkweeds	Clopyralid
PER14729	30/06/2019	Hygrophila	Glyphosate Metsulfuron-methyl
PER14731	30/06/2019	Long-leaf willow primrose	Glyphosate
PER14733	30/06/2019	Alligator weed	Dichlobenil Glyphosate Metsulfuron-methyl
PER14877	30/06/2019	Mother-of-millions	Glyphosate
PER14928	30/09/2019	Hawkweeds	Picloram + Triclopyr + Aminopyralid Triclopyr + Picloram
PER14929	30/10/2019	Mimosa bush	Clopyralid

# Noxious and environmental weed control

Registration of a pesticide is not a recommendation from the NSW Department of Primary Industries for the use of a specific pesticide in a particular situation. Users must satisfy themselves that the pesticide they choose is the best one for the situation and weed. Users must also carefully study the container label before using any pesticide, so that specific instructions relating to the rate, timing, application and safety are noted. This publication is presented as a guide to assist users in planning their weed control.

**Only herbicides registered for use in non-cropping areas are listed on the following pages. If there is any omission or error in this list of chemicals please notify the authors.**

## African boxthorn – *Lycium ferocissimum*

**Non-chemical options:** Mechanically remove mature bushes/thickets when soil is wet (winter) and spray regrowth.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL per 100 L water	Handgun application for when bushes have good leaf cover, growth and no leaf fall. Only apply to plants less than 2 m tall.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Handgun application for when bushes have good leaf cover, growth and no leaf fall. Only apply to plants less than 2 m tall.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark application up to 5 cm basal diameter. Cut stump application for over 5 cm diameter.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	1.3 L per 100 L of water	Handgun application for small bushes only. Spray soil to drip line. Thorough coverage is essential. Spray prior to budburst.
<b>Glyphosate</b> 360 g/L Roundup®	0.7–1.0 L per 100 L	Handgun application, with low rate on young bushes, high water rate on mature bushes. Do not spray in hot dry summer periods.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 30 L of diesel	Cut stump application for any stem diameter.
<b>Tebuthiuron</b> 200 g/kg Graslan®	2 g per m <sup>2</sup>	Hand application (granules). Estimate the area within 30 cm beyond the drip line of the target plant and calculate the amount of Graslan required. Do not apply near desirable trees.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Glyphosate</b> 360 g/L Roundup®	10 g metsulfuron plus 1 litre glyphosate in 100 L of water	Always add non-ionic surfactant to the spray mix. Apply to actively growing weeds.
PER9907 <b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Stem injection or stem scrape application

## Product names

The product names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product does not imply endorsement by NSW Department of Primary Industries over any other equivalent product from another manufacturer.

Abbreviation	Details
/ha	per hectare (10 000 m <sup>2</sup> )
g (kg)	gram (kilogram)
L (mL)	litre (millilitre)
g/L (g/kg)	grams per litre (grams per kilogram)
m (m <sup>2</sup> )	metre (square metre)
Various products	There are a number of products on the market with this active ingredient registered for control of this weed.

## African lovegrass – *Eragrostis curvula*

**Non-chemical options:** Pasture improvement and grazing management will reduce re-establishment.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	1.0 L per 100 L water	Apply to actively growing plants.
	<b>Glyphosate</b> 360 g/L Roundup®	6.0 L per 100 L water	Boom application.
	<b>Flupropanate</b> 745 g/L Tussock®	300 mL per 100 L of water	Spot spray application.
	<b>Flupropanate</b> 745 g/L Tussock®	3.0 L/ha	Boom spray application using 150 L water/ha. Apply July to December.
PER9792	<b>Flupropanate</b> 745 g/L Tussock®	1.5–3 L/ha	Ground and aerial boom application. Only apply to green actively growing plants.
PER9792	<b>Flupropanate</b> 745 g/L Tussock®	150–300 mL per 100 L water	Spot spray application. Only apply to green actively growing plants.

## African olive – *Olea europaea* subsp. *cuspidata*

**Non-chemical options:** Hand remove seedlings.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 600 g/L Garlon® 600	4.0 L per 60 L diesel	Basal bark application up to 5 cm basal diameter or cut stump application over 5 cm.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray seedlings/coppice shoots.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate per 1.5 parts of water	Cut stump, stem scrape or injection, saplings or large trees and shrubs.
PER11788	<b>Triclopyr</b> 600 g/L Garlon® 600	800 mL per 10 L diesel	Basal bark application.

## Aleman grass – *Echinochloa polystachya*

Aleman grass is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Individual plants can be carefully dug up, dried and burnt or buried.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	Up to 200 mL in 10 L of water	Spot spray application.

## Alligator weed – *Alternanthera philoxeroides*

Alligator weed is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Biological control agents are effective in some core coastal wetland situations for the aquatic plant form.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	10 mL per 1 L of water	Spot spray. Actively growing from summer through winter, floating form only.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L water	Apply in terrestrial situations only. A minimum of 3 years' spraying is required to achieve complete control.
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Spot spray application, for terrestrial situations only.
PER11737	<b>Imazapyr</b> 150 g/L + <b>Glyphosate</b> 150 g/L Arsenal Express®	500 mL/100 L of water	Spot spray application. Add hasten or Uptake spraying oil at 0.5 L/ha
PER14200	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Hand gun application. Refer to permit for critical use comments.
PER14733	<b>Glyphosate</b> 360 g/L Roundup®	10 mL in 1 L of water	For control in urban and residential backyards.
PER14733	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g in 10 L of water	For control in urban and residential backyards.
PER14733	<b>Dichlobenil</b> 67.5 g/kg Casoron G®	25–37 g per square metre	Granular application for home garden situations
PER14734	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L water (to a maximum rate of 600 L/ha of weed surface)	Aquatic areas and terrestrial areas across NSW except for the core areas of Port Stephens Council, Maitland City Council, Penrith City Council and Hawkesbury City Council. Only apply as a spot spray using a hand directed spray. Do not apply more than 3 applications per growing season. See permit for details.

## Anchored water hyacinth – *Eichhornia azurea*

Anchored water hyacinth is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Plants can be manually removed from the water body and carefully disposed.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	Up to 200 mL in 10 L of water	Spot spray application

## Arundinaria reed – *Arundinaria* species

**Non-chemical options:** Physical removal gives best results.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray. Spray regrowth up to 0.5 m only.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump. Retreatment necessary.



## Asparagus fern – *Asparagus virgatus*

Asparagus fern is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray application, best done between flowering and berries forming.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/stem scrape application
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1–2 g per 10 L of water plus a non-ionic surfactant.	Spot spray application, best done between flowering and berry formation.
PER9907	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 to 600 mL per 100 L of water	Spot spray application

## Azolla – *Azolla* species

**Non-chemical options:** Small infestations can be mechanically removed.

	Chemical and Concentration	Rate	Comments
	<b>Diquat</b> 200 g/L Reglone®	5.0–10.0 L/ha	Spray to wet all foliage thoroughly. Observe withholding period.
	<b>Orange oil</b> 55.2 g/kg Water Clear®	1 part product per 100 parts water	Spray on to free-floating plants.

## Balloon vine – *Cardiospermum grandiflorum*

**Non-chemical options:** Seedlings can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray. Spray regrowth up to 0.5 m only.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump. Retreatment necessary.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL of glyphosate plus 1.5 g of metsulfuron-methyl in 10 L of water	Spot spray application.

## Bamboo – *Bambusa species*

**Non-chemical options:** Physical removal will give best results.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	10 mL per 1 L of water.	Foliar application between 1 and 2 m tall.
	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 6 parts water	Cut stump method. Cut stems to 20 cm. Pour mixture down stem or wet cut.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray. Spray regrowth up to 0.5 m only.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump. Retreatment necessary.
PER14302	<b>Flupropanate</b> 745 g/L Tussock®	1 L in 100 L of water	Hand gun application

## Bathurst burr – *Xanthium spinosum*

**Non-chemical options:** Slash before flowering. Maintain competitive pastures.

	Chemical and Concentration	Rate	Comments
	<b>2,4-D amine</b> 625 g/L Amicide® 625	80–110 mL per 150 L water	Spot spray. Seedlings only, actively growing.
	<b>MCPA</b> 500 g/L Various products	1–2 L/ha	Apply at seedling stage.
	<b>Fluroxypyr</b> 200 g/L Starane™	75 mL per 100 L of water	Apply to actively growing plants.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	45 mL per 100 L water	Apply to actively growing plants.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	1 L per Hectare	Boom spray application
	<b>2,4-D LV ester</b> 680g/L Various products	1.7 to 3.3 L per hectare	Boom spray application, use higher rates on mature plants

## Bellyache bush – *Jatropha gossypifolia*

Bellyache bush is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small individual plants can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL in 100 L of water	Spot spray application

## Bitou bush – *Chrysanthemoides monilifera* subsp. *rotundata*

Bitou bush is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Hand removal of young plants, encourage native regeneration and integrate the use of biological control agents. Fire can be effective, where practical.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	5 or 10 mL per 1 L of water	Handgun or knapsack. Spray to wet all foliage. Apply at peak flowering to actively growing bushes during winter. Do not apply during periods of drought stress. Use the higher rate for plants over 1.5 m.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Apply as close as possible to the flowering stage.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Spray to wet all foliage thoroughly.
	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 29 parts water or 1 part per 19 parts water	Gas gun/Splatter gun application. Use the higher rate on bushes over 1.5 m
	<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>Glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) per 100 L of water	Spray to wet all foliage thoroughly.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	Spray to wet all foliage thoroughly. Treat at flowering to fruiting stage.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Spray to thoroughly wet all foliage.
PER12251	<b>Glyphosate</b> 360 g/L Roundup®	2 L /ha	Aerial boom spray applications. Refer to the critical use comments in the permit.
PER12251	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	20–30g /ha	Aerial boom spray applications. Refer to the critical use comments in the permit.

## Black knapweed – *Centaurea nigra*

Black knapweed is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Dig out single plants. Improve pastures with a vigorous perennial species.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	10 mL per 1 L of water	Spot spray on non-crop land – aquatic areas, dams, irrigation channels and banks.

## Black willow – *Salix nigra*

Black willow is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanical removal or use the cut-stump method of treatment.

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 15 L of diesel	Cut stump application method.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Glyphosate</b> 360 g/L Roundup®	1.0–1.3 L in 100 L of water	Spray to wet all foliage. Use the higher rate for trees 1–2 m high.
<b>Glyphosate</b> 360 g/L Roundup®	Undiluted	Stem injection.

## Blackberry – *Rubus fruticosus* species aggregate

**Non-chemical options:** Slashing of juvenile bushes and the use of goats will give some control. Biological control agents are also available. Improve pastures with a vigorous perennial species. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 200 g/L + <b>Picloram</b> 100 g/L Tordon® DSH	500 mL per 100 L of water	Late spring to autumn treatment. Use an adjuvant.
<b>Glyphosate</b> 360 g/L Roundup®	10–13 mL per 1 L of water	Flowering to leaf fall. Use higher rate on old, dense infestations.
<b>Glyphosate</b> 835 g/kg + <b>Metsulfuron-methyl</b> 10 g/kg Trounce®	1 measured pack (173 g) per 100 L of water	Apply from flowering until before leaf yellowing. Do not apply to bushes with mature fruit.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Apply when bushes are actively growing. Thoroughly wet all foliage and canes at commencement of flowering.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Thoroughly wet all foliage and canes. Commence application at flowering as this indicates good growing conditions.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 or 500 mL per 100 L water	Treat in late spring to autumn. Use an adjuvant.
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Spray to thoroughly wet all foliage, Uptake spray oil or Pulse penetrant should be added.
<b>Hexazinone</b> 250 g/L Velpar® L	Undiluted (4 mL per spot)	Bushes up to 1 m in height.
<b>Picloram</b> 20 g/kg Tordon® Granules	35–45 g /m <sup>2</sup>	Apply granules over an area extending from main stem to 30 cm outside the drip line.
<b>Triclopyr</b> 600 g/L Garlon® 600	170 mL per 100 L of water	Late spring to early autumn. Actively growing bushes. Do not use under dry conditions.
<b>Triclopyr</b> 600 g/L Garlon® 600	280 L per 10 L of water	Gas gun/Splatter gun application. Good control will be achieved, similar to high volume application, where bush size enables good coverage of entire bush. The use of marking agent is recommended.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 or 500 mL per 100 L of water	Late spring to early autumn when bushes are actively growing. Use the higher rate on plants which have been damaged by grazing stock or insects.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	335 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.

## Blue heliotrope – *Heliotropium amplexicaule*

Blue heliotrope is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Dig out single plants. Improve pastures with a vigorous perennial species.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL per 100 L water	Treat at flowering.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Apply at flowering in a minimum spray volume of 1250 L/ha.
	<b>Dicamba</b> 500 g/L Kamba® 500	130 mL per 15 L of water	Knapsack spray.
	<b>Dicamba</b> 500 g/L Kamba® 500	0.6 L per 100 L of water	High volume spot spray.
	<b>Dicamba</b> 500 g/L Kamba® 500	8.8 L/ha	Boom spray. Apply to young, actively growing plants.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	1.0 L per 100 L of water	Grass pastures only. Spot spray. Apply to young actively growing plants.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	600mL per 100 L of water	Spot spray. Apply during flowering.
	<b>Fluroxypyr</b> 200 g/L Starane™	1.0 L per 100 L of water	Spot spray. Apply during flowering.
	<b>Tebuthiuron</b> 200 g/kg Graslan®	0.5 g /m <sup>2</sup>	Do not use within 30 m of trees. Do not apply to areas greater than 0.5 hectares in size.
PER12286	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Plus 0.1% surfactant. Spot spray. Apply when plants are actively growing spring to autumn.

## Boneseed – *Chrysanthemoides monilifera* subsp. *monilifera*

Boneseed is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Hand removal of young plants, encourage native regeneration and integrate the use of biological control agents. Fire can be effective, where practical.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	5 or 10 mL per 1 L of water	Handgun or knapsack. Spray to wet all foliage. Apply at peak flowering to actively growing bushes during winter. Do not apply during periods of drought stress. Use the higher rate for plants over 1.5 m.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Apply as close as possible to the flowering stage.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Spray to wet all foliage thoroughly.
	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 29 parts water or 1 part per 19 parts water	Gas gun/Splatter gun application. Use the higher rate on bushes over 1.5 m
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	Spray to wet all foliage thoroughly. Treat at flowering to fruiting stage.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Spray to thoroughly wet all foliage.
PER12251	<b>Glyphosate</b> 360 g/L Roundup®	2 L /ha	Aerial boom spray applications. Refer to the critical use comments in the permit.
PER12251	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	20–30 g /ha	Aerial boom spray applications. Refer to the critical use comments in the permit.

## Bracken fern – *Pteridium esculentum*

**Non-chemical options:** Manually remove small or individual plants

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	1.5 L per 100 L of water	Spot spray application. Apply during autumn at full frond expansion, while plants are actively growing. Repeat treatments necessary. Add surfactant.
	<b>Glyphosate</b> 360 g/L Roundup®	9.0 L/ha	Boom spray application. Apply during autumn at full frond expansion, while plants are actively growing. Repeat treatments necessary. Add surfactant.
	<b>Glyphosate</b> 360 g/L Roundup®	1 L in 2 L of water	Wiper application
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Spot spray.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	60 g/ha	Boom spray. Spray after full frond expansion. Avoid spraying when plants are in stress.
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Spray after full frond expansion.

## Bridal creeper – *Asparagus asparagoides*

**Non-chemical options:** Dig out all tubers and burn. A biocontrol fungus is also available.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray August to September only.
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g metsulfuron-methyl to 100 L water	Spray August to September only.

## Bridal veil creeper – *Asparagus declinatus*

Bridal veil creeper is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem application
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1–2 g in 10 L of water plus a non-ionic surfactant	Spot spray application

## Broad-leaf pepper tree – *Schinus terebinthifolius*

Broad-leaf pepper tree is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small seedling plants can be removed manually.

	Chemical and Concentration	Rate	Comments
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	21 mL per 1 L diesel	Basal bark application.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL per 100 L water	Foliar spray.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray seedlings and coppice shoots.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem application for saplings. Stem injection application large trees and shrubs.

## Buffalo burr – *Solanum rostratum*

**Non-chemical options:** Single plants can be manually removed.

Chemical and Concentration	Rate	Comments
2,4-D LV ester 680g/L Various products	800 mL–1.15 L/Ha	Use in grass pastures only. Seedling to pre-flowering. Use higher rate as plants mature.

## Cabomba – *Cabomba* species

**Non-chemical options:** Physical removal is recommended where appropriate. Draining and drying in suitable situations can control plants. Contain infestations to avoid further spread. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

Chemical and Concentration	Rate	Comments
Carfentrazone-ethyl 240 g/L Shark™ Aquatic Herbicide	830 mL per 100,000 L water [2 ppm (2 mg/L) carfentrazone-ethyl]	Non-flowing water bodies. Apply onto the surface or below the surface where cabomba is growing. The intention is to achieve a concentration of 2 ppm (2 mg/L) carfentrazone-ethyl in the water where cabomba is growing. Refer to the label for nozzle requirements. Do not apply to more than 50% of the volume of the water body in a single application. Do not apply subsequent application to the waterbody within 3 months. Retreatments of heavy infestations may be required.

## Californian burr – *Xanthium orientale*

**Non-chemical options:** Slash before flowering. There are a number of biological control agents that work in selected areas and situations.

Chemical and Concentration	Rate	Comments
2,4-D amine 625 g/L Amicide® 625	800–1.1 L/ha	Boom spray. Seedlings only.
2,4-D LV ester 680g/L Various products	800 mL/ha	Boom spray application, from seedlings to pre-flowering. Use higher rates as plants mature



## Camphor laurel – *Cinnamomum camphora*

**Non-chemical options:** Seedlings can be manually removed. Trees can be physically removed if the cut stump is then treated with herbicide. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 or 500 mL per 100 L water	Use higher rate on trees over 2 m tall. Apply as a thorough foliar spray.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 or 500 mL per 100 L of water	Use higher rate on trees over 2 metres tall. Apply as a thorough foliage spray.
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1 L per 60 L of diesel	Basal bark application for basal diameter less than 10 cm or cut stump application for greater than 10 cm.
	<b>Triclopyr</b> 200 g/L + <b>Picloram</b> 100 g/L Tordon® DSH	1 part per 4 parts water	Stem injection application.
	<b>Triclopyr</b> 600 g/L Garlon® 600	170 mL per 100 L of water	Seedling to three metres tall.
	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1 part water, 2 mL per cut	Stem injection for basal diameter up to 25 cm.
	<b>Glyphosate</b> 360 g/L Roundup®	Undiluted, 2 mL per cut.	Stem injection for basal diameter 25 cm to 60 cm.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray seedlings and coppice shoots.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem application for saplings. Stem injection application large trees and shrubs.
PER10615	<b>Glyphosate</b> 360 g/L Roundup®	Undiluted	4 mL per drill hole/axe cut

## Canna lily – *Canna indica*

**Non-chemical options:** Small infestations can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel across the cut surface on the rhizome.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray. Apply as foliar application. Spray regrowth after slashing.

## Cape broom – *Genista monspessulana*

Cape broom is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanical control can be an option for small, isolated infestations.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	250 or 350 mL per 100 L of water	Spring to mid summer prior to pod formation. Apply as a thorough foliage spray.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel across the cut surface on the rhizome.
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	250 or 350 mL per 100 L water	Use higher rate on trees over 2m tall. Apply as a thorough foliar spray.

## Cape ivy – *Delairea odorata*

**Non-chemical options:** Runners can be rolled up and manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel across the cut surface on the rhizome.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem.

## Cape tulip – *Moraea* species

**Non-chemical options:** Cultivation is ineffective alone, renovate pastures after chemical treatment.

	Chemical and Concentration	Rate	Comments
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	5 g/ha	Apply at bulb exhaustion, usually during July/early August. Repeat treatments may be required.
	<b>2,4-D LV ester</b> 680g/L Various products	1.7–3.3 L/ha	Boom spray. Spray before flowering.
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	10 g/ha	Apply at bulb exhaustion, usually during July/early August. Repeat treatments may be required.

## Cassia – *Senna pendula* var. *glabrata*

**Non-chemical options:** Young seedlings can be manually removed. Seed pods should be collected and removed from the site.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Stem injection/cut stump application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate per 10 L water	Spot spray application.
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1.0–2.0 g metsulfuron-methyl per 10 L water	Spot spray application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 1.5 g metsulfuron-methyl per 10 L water	Spot spray application.

## Castor oil plant – *Ricinus communis*

**Non-chemical options:** Physically remove young plants.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 60 L of diesel	Basal bark application for plants up to 5 cm basal diameter. Cut stump application for plants with larger basal diameter.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>2,4-D amine</b> 625 g/L Amicide® 625	340 mL per 150 L of water, or 3.4 L/Ha	Apply to young, actively growing plants.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray seedlings and coppice shoots.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem application for saplings. Stem injection application large trees and shrubs.

## Cat's claw creeper – *Dolichandra unguis-cati*

Cat's claw creeper is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Difficult to manually control because of the root and rhizome system.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray to kill regrowth
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem/inject
PER13914	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	400 mL product per 100 L water.	Hand gun spray vines on ground.

## Cecropia – *Cecropia* species

Cecropia is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Seedlings can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump application

## Cherry guava – *Psidium cattleianum*

**Non-chemical options:** Physical removal gives best results.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Fluroxypyr</b> 200 g/L Starane™	35 mL per 1 L of diesel	Basal bark application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/ stem injection

## Chilean needle grass – *Nassella neesiana*

Chilean needle grass is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Good grazing management combined with a pasture improvement program is required for most effective control.

	Chemical and Concentration	Rate	Comments
	<b>Flupropanate</b> 745 g/L Tussock®	1.5–3.0 L/ha	Boom application. Apply to actively growing plants from Spring to Autumn.
	<b>Flupropanate</b> 745 g/L Tussock®	200 mL flupropanate plus 150 mL glyphosate 360g/L per 100 L of water	Spot spray application. Apply to actively growing plants from Spring to Autumn.
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	1 L per 100 L water	Spot spray
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	1 L/ha	Boom spray

## Chinese celtis – *Celtis sinensis*

Chinese celtis is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Seedlings can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	21 mL per 1 L diesel	Basal bark application.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spray seedlings and coppice shoots.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem application for saplings. Stem injection application large trees and shrubs.

## Chinese tallow tree – *Triadica sebifera*

Chinese tallow tree is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Seedlings and small trees may be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	Tank mix of 1:1.5 of glyphosate plus 1 g of metsulfuron-methyl in 1 L of water	Stem injection method.

## Chinese violet – *Asystasia gangetica* subsp. *micrantha*

Chinese violet is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Seedlings and small plants can be manually removed.

	Chemical and Concentration	Rate	Comments
PER13678	MCPA 340 g/L + Dicamba 80 g/L Kamba® M	100 mL per 15 L of water per 150 sq. m. (1 L/10 m <sup>2</sup> )	Spot spray application. Apply to actively growing weeds before seed set on the plants.

## Climbing asparagus – *Asparagus africanus*

Climbing asparagus is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut/stump stem injection application
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray application, best done between flowering and berries forming.
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem.
PER9907	Metsulfuron-methyl 600 g/kg Brush-off®	1–2 g in 10 L of water plus add a non-ionic surfactant	Spot spray application
PER9907	Fluroxypyr 333 g/L Starane™ Advanced	300 to 600 mL per 100 L of water	Spot spray application

## Climbing asparagus fern – *Asparagus plumosus*

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut/stump stem injection application
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray application, best done between flowering and berries forming.
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem.
PER9907	Metsulfuron-methyl 600 g/kg Brush-off®	1–2 g in 10 L of water plus add a non-ionic surfactant	Spot spray application
PER9907	Fluroxypyr 333 g/L Starane™ Advanced	300 to 600 mL per 100 L of water	Spot spray application

## Cockspur coral tree – *Erythrina crista-galli*

**Non-chemical options:** Physical removal is an option, always treat the remaining stump.  
Take care when removing the plant as all parts can potentially regrow

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/drill/axe cut/inject
PER12367	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	50 mL/10 L water	Spot spray application. Spray reshoooting cut limbs.
PER12367	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	50 mL/10 L water	Spot spray application. Spray reshoooting cut limbs.

## Columbus grass – *Sorghum x alnum*

**Non-chemical options:** Summer cultivation before heading will give some control.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 450 g/L Various products	10 mL per 1 L of water	Apply at early flowering to actively growing plants.
	<b>Flupropanate</b> 745 g/L Tussock®	1.0 L per 100 L of water	Apply when actively growing.

## Coolatai grass – *Hyparrhenia hirta*

**Non-chemical options:** Individual plants can be pulled by hand.

	Chemical and Concentration	Rate	Comments
	<b>Flupropanate</b> 745 g/L Tussock®	300 mL per 100 L water	Apply in winter and spring between July and October.
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate in 10 L of water	Spot spray application. Can be used 2–3 times from September to May.
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 20 mL flupropanate per 10 L of water	Spot spray application between July and October. Only use the tank mix once per season.

## Cotoneaster – *Cotoneaster glaucophyllus*

**Non-chemical options:** Seedlings and small plants can be hand pulled. Ensure all roots are removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate per 1.5 parts of water	Cut stump or drill/axe cut/inject.

## Creeping knapweed – *Rhaponticum repens*

**Non-chemical options:** Avoid cultivation, as it will increase plant populations from root pieces. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

	Chemical and Concentration	Rate	Comments
	<b>Dicamba</b> 500 g/L Kamba® 500	130 mL per 15 L of water	Knapsack spray.
	<b>Dicamba</b> 500 g/L Kamba® 500	600 mL per 100 L of water	High volume spot spray.
	<b>Dicamba</b> 500 g/L Kamba® 500	8.8 L/ha	Boom spray. Spray at flowering, using a minimum water rate of 1500 L/ha.
	<b>Amitrole</b> 250 g/L + <b>Ammonium thiocyanate</b> 220 g/L Various products	1.1 L per 100 L of water	Actively growing plants before flowering.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	1.3–2.0 L per 100 L of water	Spot spray.

## Crofton weed – *Ageratina adenophora*

**Non-chemical options:** Well-managed and improved pastures will assist control.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL in 100 L of water	Spring to autumn. Spray all foliage to point of run-off. Actively growing plants.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 mL per 100 L of water	Spring to autumn. Spray all foliage to point of run-off. Actively growing plants.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL in 100 L of water	Apply to actively growing seedlings and young plants up to flowering.
	<b>Fluroxypyr</b> 200 g/L Starane™	500 mL per 100 L of water	Apply to actively growing seedlings and young plants up to flowering.
	<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	700 mL in 100 L of water	Spot spray application. Apply to actively growing plants from October to April
	<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	1.5 L/ha	Boom spray application. Apply to actively growing plants from October to April
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	30 g per 100 L of water	Folia spray to thoroughly wet the plants.
	<b>MCPA</b> 340 g/L + <b>Dicamba</b> 80 g/L Kamba® M	190–270 mL per 100 L of water	Spray during active growth. For use in grass pastures.
	<b>MCPA</b> 340 g/L + <b>Dicamba</b> 80 g/L Kamba® M	2.8–4.0 L/ha	Spray during active growth. For use in grass pastures.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	For use in grass pasture when weed is actively growing.
	<b>Glyphosate</b> 360 g/L Roundup®	500 mL per 100 L of water	Actively growing plants with full foliage.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	15 g per 100 L of water	Add surfactant. Thoroughly wet all foliage to point of run-off up to bud stage to prevent seed set.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.

## Cumbungi – *Typha* species

**Non-chemical options:** Small infestations can be mechanically removed.

Chemical and Concentration	Rate	Comments
<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	13 mL per 1 L of water	Spot spray application. Apply to actively growing plants at early flowering.
<b>Amitrole</b> 250 g/L Amitrole T <sup>®</sup>	2.3 L per 100 L of water	Spot spray application. Apply during flowering between January and May.
<b>2,2-DPA</b> 740 g/kg Propon <sup>®</sup>	1.0–2.0 kg per 100 L of water	Hand gun, spot spray application. For use in irrigation channels and bore drains.
<b>Imazapyr</b> 750 g/kg Various products	3 L/ha	Boom spray in irrigation channels and drains.

## Devil's claw – purple-flowered – *Proboscidea louisianica*

**Non-chemical options:** Mechanical removal or hoe single plants before pods form.

Chemical and Concentration	Rate	Comments
<b>2,4-D LV ester</b> 680 g/L Estercide <sup>®</sup> 800	1.15 to 1.7 L/ha	Boom spray application, before pods form.

## Devil's claw – yellow-flowered – *Ibicella lutea*

**Non-chemical options:** Mechanical removal or hoe single plants before pods form.

Chemical and Concentration	Rate	Comments
<b>2,4-D LV ester</b> 680 g/L Estercide <sup>®</sup> 800	1.15 to 1.7 L/ha	Boom spray application, before pods form.

## Dodder – *Cuscuta* species

**Non-chemical options:** Quarantine the infestation and burn; maintain a grass pasture for a minimum period of 5 years to exhaust seed supply in the soil. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

Chemical and Concentration	Rate	Comments
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off <sup>®</sup>	1 g per 100 L of water	Apply as a spot spray to point of run before flowering.
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger <sup>™</sup>	2 g per 100 L of water	Handgun application to the point of run off.

## Duckweed – *Lemna minor*

**Non-chemical options:** Small infestations can be mechanically removed.

Chemical and Concentration	Rate	Comments
<b>Diquat</b> 200 g/L Reglone <sup>®</sup>	400 mL in 100 L of water	Spray to wet all foliage thoroughly, add Agral 600.
<b>Diquat</b> 200 g/L Reglone <sup>®</sup>	5.0–10.0 L/ha	Observe withholding period.
<b>Orange oil</b> 55.2 g/kg Water Clear <sup>®</sup>	1.0 L per 100 L of water	Spray on to free-floating plants.



## Elodea – *Elodea canadensis*

**Non-chemical options:** Small infestations can be mechanically removed.

Chemical and Concentration	Rate	Comments
<b>Copper</b> 110 g/L Cupricide 110®	1 L per 10 cm water depth	For application follow label directions.
<b>Diquat</b> 200 g/L Reglone®	5 L /megalitre water	Apply by injection below the surface or as a surface spray.

## Fireweed – *Senecio madagascariensis*

**Non-chemical options:** Pasture improvement and proper grazing management will assist with control.

For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

Chemical and Concentration	Rate	Comments
<b>Bromoxynil</b> 200 g/L Bromicide®	1.4 L/ha	Boom spray. Seedling application. In pastures apply with low volume boom spray during autumn/winter when weeds are young and actively growing. Observe withholding period.
<b>Bromoxynil</b> 200 g/L Bromicide®	2.8 L/ha	Boom spray. Early flowering application. In pastures apply with low volume boom spray during autumn/winter when weeds are young and actively growing. Observe withholding period.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL in 100 L of water	Apply as a thorough foliar spray
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L of water	Apply to flowering plants up to 30 cm tall
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	1.5 L/ha	Treat seedling plants up to flowering
PER10462 <b>2,4-D amine</b> 625 g/L Amicide® 625	2–2.5 L/ha	Boom spray application
PER100146 <b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Spot spray application
PER100146 <b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	40 g/ha	Boom spray

## Fishbone fern – *Nephrolepis cordifoliarr*

**Non-chemical options:** Dig out, burn. This plant has rhizomes, which are a means of spread.

Chemical and Concentration	Rate	Comments
PER9907 <b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1.0–2.0 g metsulfuron-methyl per 10 L of water	Knapsack spot spray.
PER9907 <b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 1.5 g metsulfuron-methyl per 10 L of water	Knapsack spot spray.

## Galenia – *Galenia pubescens*

**Non-chemical options:** A perennial prostrate or semi-prostrate plant that is difficult to control.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL per 100 L of water	Fresh spring/summer growth. High volume spot spray, treat to visual wetness.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	5 L/ha	Boom spray. Apply in 2000 L water /ha.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Fresh spring/summer growth. High volume spot spray, treat to visual wetness.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	5 L/ha	Boom spray application

## Galvanised burr – *Sclerolaena birchii*

**Non-chemical options:** Deep cultivation to bury the seed, with pasture improvement and grazing management, will give control.

Chemical and Concentration	Rate	Comments
<b>Dicamba</b> 500 g/L Kamba®	600 mL per 100 L of water	High volume spot spray.
<b>Dicamba</b> 500 g/L Kamba®	8.8 L/ha	Boom spray. Use a minimum of 1500 L water /ha. Add a surfactant.
<b>2,4-D amine</b> 625 g/L Amicide® 625	320 mL per 100 L of water	Apply to young, actively growing plants.
<b>Dichlorprop</b> 600 g/L Lantana 600®	1.0 L per 100 L of water	Apply to young, actively growing plants.

## Giant devil's fig – *Solanum chrysotrichum*

**Non-chemical options:** Small individual plants can be carefully manually removed.

	Chemical and Concentration	Rate	Comments
PER12942	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 to 500 mL per 100 L of water.	Hand gun application, plus add a wetter
PER12942	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 to 500 mL of Grazon plus 10 g of Brushoff in 100 L of water	Handgun application , plus add a wetter.
PER12942	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	2 L Roundup plus 10 g of Brushoff in 100 L of water	Handgun application, plus add a wetter.

## Giant Parramatta grass – *Sporobolus fertilis*

**Non-chemical options:** Pasture improvement and proper grazing management will assist control.

For further information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

	Chemical and Concentration	Rate	Comments
	<b>Flupropanate</b> 745 g/L Tussock®	200 mL per 100 L of water	High volume spot spray. Best results during late winter and early spring when desirable species are semi-dormant. Observe 4 month withholding period for blanket spray application.
	<b>Flupropanate</b> 745 g/L Tussock®	1.5–2.0 L/ha	Boom spray. Best results during late winter and early spring when desirable species are semi-dormant. Observe 4 month withholding period for blanket spray application.
	<b>Glyphosate</b> 360 g/L Roundup®	10–15 mL per 1 L of water	Spot spray. Apply when plants are actively growing.
	<b>Glyphosate</b> 360 g/L Roundup®	6.0 L/ha	Boom application for pasture replacement/improvement and best done as a split treatment.
	<b>2,2-DPA</b> 740 g/kg Propon®	1.0 kg per 100 L of water	Handgun application.
	<b>2,2-DPA</b> 740 g/kg Propon®	5–10 kg/ha	Boom spray application. Apply when plants are actively growing.
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	3.3 L per 10 L of water	Wick wiper application. Apply when plant is actively growing.

## Giant rat's tail grass – *Sporobolus pyramidalis*

Giant rat's tail grass is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Pasture improvement and proper grazing management will assist control.

	Chemical and Concentration	Rate	Comments
	<b>Flupropanate</b> 745 g/L Tussock®	200 mL per 100L of water	Handgun application.
	<b>Flupropanate</b> 745 g/L Tussock®	1.5–2.0 L/ha	Boom spray. Best results during late winter and early spring when desirable species are semi-dormant. Four month withholding period for blanket spray application.
	<b>Glyphosate</b> 360 g/L Roundup®	10–15 mL per 1 L water	Handgun application for when plants are actively growing.
	<b>Glyphosate</b> 360 g/L Roundup®	6.0 L/ha	Boom application for pasture replacement/ improvement and best done as a split treatment. Apply when plants are actively growing.
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	3.3 L per 10 L of water	Wick wiper application. Apply when plant is actively growing.

## Giant reed – *Arundo donax*

**Non-chemical options:** Physical removal of small infestations is possible.

	Chemical and Concentration	Rate	Comments
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 50 parts water	Knapsack application
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 1.5 parts of water	Cut stump application.

## Ginger lily – *Hedychium gardnerianum*

Ginger lily is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small individual plants can be manually removed.

	Chemical and Concentration	Rate	Comments
PER9907	Glyphosate 360 g/L Roundup®	200 mL of glyphosate plus 1.5 g of Metsulfuron methyl in 10 L of water	Spot spray application, add a surfactant.

## Glory lily – *Gloriosa superba*

**Non-chemical options:** Physical removal for small infestations.

	Chemical and Concentration	Rate	Comments
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 50 parts water	Knapsack application
PER9907	Glyphosate 360 g/L Roundup®	1 part glyphosate to 1.5 parts of water	Cut stump/scrape stem application.
PER9907	Glyphosate 360 g/L Roundup®	200 mL glyphosate plus 1.5 g metsulfuron- methyl per 10 L of water	Knapsack application

## Gorse – *Ulex europaeus*

Gorse is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Physical removal of large bushes.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	250 or 350 mL per 100 L of water	Handgun application to actively growing plants. Use higher rate on bushes over 1.5 m high or as an autumn treatment.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Handgun application for Winter treatment
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	250 or 350 mL per 100 L of water	Handgun application for actively growing plants. Use higher rate on bushes over 1.5 m high or as an autumn treatment.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Handgun application for Winter treatment
<b>Triclopyr</b> 200 g/L + <b>Picloram</b> 100 g/L Tordon® DSH	375 mL per 100 L of water	Handgun application from September to March.
<b>Triclopyr</b> 600 g/L Garlon® 600	170 or 340 mL per 100 L water	Handgun application, add non-ionic surfactant. Spring to mid-summer, higher rate on older bushes.
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	30 g per 100 L of water	Handgun application for bushes up 2m tall. Add Pulse penetrant.
<b>Glyphosate</b> 835 g/kg + <b>Metsulfuron-methyl</b> 10 g/kg Trounce®	1 measured pack (173 g) in 100 L of water	Apply to bushes up to 2 m high when actively growing.
<b>Glyphosate</b> 360 g/L Roundup®	1.0 L per 100 L of water	Add Pulse (wetting agent), apply to actively growing bushes. Spray to wet all foliage.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	15 g per 100 L of water	Apply to bushes up to two metres tall. Ensure thorough spray penetration and coverage of whole plant.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Green cestrum – *Cestrum parqui*

**Non-chemical options:** A toxic plant in both the green and dead state. Physical removal is difficult because of the persistent regrowth from roots.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply from late spring to early autumn. Any regrowth and seedlings must be resprayed when 1 m high.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Apply from late spring to early autumn. Any regrowth and seedlings must be resprayed when 1 m high.
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark application.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	Handgun application on actively growing bushes in full leaf.
	<b>Amitrole</b> 250 g/L + <b>Ammonium thiocyanate</b> 220 g/L Various products	1.1 L per 100 L of water	Handgun application on active growth, before flowering.
	<b>Triclopyr</b> 600 g/L Garlon® 600	170 mL per 100 L of water	Retreat regrowth the next season.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut, scrape and paint.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray.
PER11427	<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 30 L of diesel	Basal bark application. DO NOT over treat as excessive run-off might affect adjacent trees and shrubs through root absorption.

## Ground asparagus – *Asparagus aethiopicus*

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 50 parts water	Spot spray application, best done between flowering and berries forming.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Cut stump/scrape stem.
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1–2 g/10 L water plus non-ionic surfactant (01.% or 1 mL/L)	Spot spray application, best done between flowering and berries forming.
PER9907	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 to 600 mL in 100 L of water	Spot spray application

## Groundsel bush – *Baccharis halimifolia*

Groundsel bush is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small plants can be manually removed, ensuring total root elimination.

Chemical and Concentration	Rate	Comments
<b>2,4-D amine</b> 625 g/L Amicide® 625	320 mL per 100 L of water	Spray actively growing bushes. Thorough coverage.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	250 or 350 mL in 100 L of water	Use lower rate on bushes 1–1.5 m high in spring and summer; use higher rate on bushes over 1.5 m high in the autumn.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	250 or 350 mL per 100 L of water	Use lower rate on bushes 1–1.5 m high in spring and summer; use higher rate on bushes over 1.5 m high in the autumn.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark/cut stump application.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	Thorough coverage required on active growth.
<b>Triclopyr</b> 600 g/L Garlon® 600	160 mL per 100 L of water	Seedlings 1 to 2 m tall.
<b>Triclopyr</b> 600 g/L Garlon® 600	320 mL per 100 L of water	Bushes over 2 m tall.
<b>Glyphosate</b> 360 g/L Roundup®	700 mL to 1.0 L per 100 L of water	Actively growing bushes. Do not apply during winter or summer drought stress.
<b>Clopyralid</b> 600 g/L Various products	165–250 mL per 100 L of water	Handgun application for active growth, lower rate on seedlings, higher rate on bushes over 2 m high.
<b>2,4-D</b> 300 g/L Affray 300®	100 mL in 10 L of water	Thorough even coverage of the plant is necessary
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Glyphosate</b> 360 g/L Roundup®	1 part per 9 parts water	Gas gun/Splatter gun application. Apply 2 x 2 mL doses per 0.5 m of bush height

## Harrisia cactus – *Harrisia* species

**Non-chemical options:** Small individual plants can be carefully manually removed.

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Foliar application.
<b>Dichlorprop</b> 600 g/L Lantana 600®	1.0 L per 60 L of water	Good soil moisture essential and spray at fruiting.
PER14442 <b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 75 L of distillate	Apply thoroughly as a foliar spray.
PER14442 <b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply as a thorough foliar spray
PER14442 <b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Common pear and smooth tree pear, with active phyllode (leaf) growth.
PER14553 <b>Amitrole</b> 250 g/L Amitrole T®	1 L in 25 L of water	Handgun application.
PER14553 <b>Metsulfuron-methyl</b> 600 g/kg Brushoff®	20 g in 100 L of water	Handgun application.
PER14553 <b>Triclopyr</b> 200 g/L + <b>Picloram</b> 100 g/L + <b>Aminopyralid</b> 25 g/L Tordon™ Regrowthmaster™ Herbicide	2.5 L in 100 L of water	Handgun application.

## Hawkweeds – *Hieracium* species

Hawkweeds is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

### Non-chemical options:

	Chemical and Concentration	Rate	Comments
PER14301	<b>Picloram</b> 20 g/kg Tordon® Granules	45 g/m <sup>2</sup>	Granular application.
PER14558	<b>Clopyralid</b> 300 g/L Lontrel®	5 mL in 1 L of water	Spot spray application
PER14928	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	250–500 mL per 100L plus BS 1000 or equivalent at 100 mL per 100L	Foliar application
PER14928	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	250–500 mL per 100L plus BS 1000 or equivalent at 100 mL per 100L	Foliar application

## Hemlock – *Conium maculatum*

**Non-chemical options:** A toxic plant; avoid feeding animals fodder that may contain the plant.

	Chemical and Concentration	Rate	Comments
	<b>MCPA</b> 340 g/L + <b>Dicamba</b> 80 g/L Kamba®	80 mL per 15 L of water	Knapsack spray.
	<b>MCPA</b> 340 g/L + <b>Dicamba</b> 80 g/L Kamba®	350 mL per 100 L of water	High volume spot spray.
	<b>MCPA</b> 340 g/L + <b>Dicamba</b> 80 g/L Kamba®	5.2 L/ha	Boom spray rate. Young active growth, repeat treatments may be necessary.

## Hoary cress – *Lepidium draba*

**Non-chemical options:** Because of the plant's root system, cultivation only aids its spread.

	Chemical and Concentration	Rate	Comments
	<b>2,4-D amine</b> 625 g/L Amicide® 625	1.1–1.7 L/ha	Boom spray application, at rosettes to pre-flowering.
	<b>Glyphosate</b> 360 g/L Roundup®	500 mL per 100 L of water	Spot spray application.
	<b>Glyphosate</b> 360 g/L Roundup®	1.5 L/ha	Boom spray. July to September, late rosette to flowering.
	<b>2,4-D LV ester</b> 680g/L Various products	1.7 to 2.1 L /ha	Boom spray application, from late rosette to pre-flowering



## Honey locust – *Gleditsia triacanthos*

**Non-chemical options:** Mechanical control is possible but will require follow up treatments.

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1 L per 60 L of diesel	Basal bark application for basal diameter less than 5 cm or cut stump application for above 5 cm.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL per 100 L of water	Foliar application, up to 2 m in height.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	900 mL per 100 L of diesel	Basal bark application. Plants up to 10 cm basal diameter.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	1.8 L per 100 L of diesel	Basal bark application. Plants 10–20 cm basal diameter.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	3 L per 100 L of diesel	Basal bark application. Plants above 20 cm basal diameter.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	3 L per 100 L of diesel	Cut stump application.
<b>Fluroxypyr</b> 200 g/L Starane™	500 mL per 100 L of water	Foliar application, up to 2 m in height.
<b>Fluroxypyr</b> 200 g/L Starane™	1.5 L per 100 L of diesel	Basal bark application. Plants up to 10 cm basal diameter.
<b>Fluroxypyr</b> 200 g/L Starane™	3 L per 100 L of diesel	Basal bark application. Plants 10–20 cm basal diameter.
<b>Fluroxypyr</b> 200 g/L Starane™	5 L per 100 L of diesel	Basal bark application. Plants above 20 cm basal diameter.
<b>Fluroxypyr</b> 200 g/L Starane™	5 L per 100 L of diesel	Cut stump application.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Horehound – *Marrubium vulgare*

**Non-chemical options:** Cut, stack and burn small areas. Establish a vigorous pasture and use good grazing management.

Chemical and Concentration	Rate	Comments
<b>Dicamba</b> 500 g/L Kamba® 500	80 mL in 100 L of water	High volume spot spray.
<b>Dicamba</b> 500 g/L Kamba® 500	1.2 L/ha	Boom spray.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL in 100 L of water	Apply as foliar spray pre-flowering
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 mL in 100 L of water	Apply as a foliar spray pre-flowering.
<b>MCPA</b> 500 g/L Various products	3 L per Hectare	Boom spray application
<b>2,4-D LV ester</b> 680g/L Various products	1.7 to 3.3 L/ha	Boom spray application for seedlings from late autumn to early spring

## Horsetails – *Equisetum* species

Horsetails is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Physical removal is ineffective due to the deep root system.

	Chemical and Concentration	Rate	Comments
PER13917	<b>Dichlobenil</b> 67.5 g/kg Casoron G®	18 g /m <sup>2</sup>	Spread granules evenly over the soil in area to be treated. Granules must be watered immediately after application.

## Hudson pear – *Cylindropuntia rosea*

**Non-chemical options:** Small plants can be carefully mechanically removed.

	Chemical and Concentration	Rate	Comments
PER14442	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Spot spray application, add 0.5 % Uptake spray oil.
PER14442	<b>Triclopyr</b> 600 g/L Garlon® 600	1 L per 75 L of diesel	Spot spray application.
PER14442	<b>Triclopyr</b> 600 g/L Garlon® 600	3 L per 100 L of water	Add 0.5% Uptake® spray oil.
PER14442	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL per 100 L of water	Spot spray application, add 0.5 % Uptake spray oil.

## Hygrophila – *Hygrophila costata*

Hygrophila is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small plants or infestations can be dug up, bagged and removed.

	Chemical and Concentration	Rate	Comments
PER14729	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1.0 L per 100 L of water	Spray when plants are actively growing, re-treatments may be necessary. Do not spray directly onto waters surface or non-target species.
PER14729	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	5–10g per 100 L of water	Minimise off target damage and water pollution by spraying towards the bank. Do not apply more than 3 times a year.

## Hymenachne – *Hymenachne amplexicaulis* and hybrids

Hymenachne is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Physical removal of small or individual plants may be effective. Take care to remove all plant material and dispose of by deep burial or drying and burning.

	Chemical and Concentration	Rate	Comments
PER13921	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	14 L/hectare	Apply by boom, handgun or knapsack, a maximum of 4 times a year. Refer to permit for further comments.
PER14283	<b>Haloxypop</b> 520 g/L Verdict®	770 mL/ha	Boomspray or handgun application. See permit for further application details

## Illyrian thistle – *Onopordum illyricum*

**Non-chemical options:** Establish a strong, perennial pasture. Grub single plants, removing 50 mm of the root. Biological control agents are available.

Chemical and Concentration	Rate	Comments
Dicamba 500 g/L Kamba® 500	40 mL per 100 L water	High volume spot spray.
Dicamba 500 g/L Kamba® 500	600 mL/ha	Boom spray.
Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application

## Indian hawthorn – *Rhaphiolepis indica*

**Non-chemical options:** Small individual plants can be manually removed.

Chemical and Concentration	Rate	Comments
PER9907 Glyphosate 360 g/L Roundup®	400 mL of glyphosate in 600 mL of water	Cut stump application
PER9907 Glyphosate 360 g/L Roundup®	200 mL in 10 L of water	Spot spray application

## Japanese honeysuckle – *Lonicera japonica*

**Non-chemical options:** Small individual plants can be manually removed

Chemical and Concentration	Rate	Comments
PER9907 Glyphosate 360 g/L Roundup®	400 mL in 600 mL of water	Cut stump application
PER9907 Metsulfuron-methyl 600 g/kg Brush-off®	10–20 g in 100 L of water	Spot spray application, add a surfactant

## Japanese sunflower – *Tithonia diversifolia*

**Non-chemical options:** Seedlings and individual plants can be physically removed.

Chemical and Concentration	Rate	Comments
Metsulfuron-methyl 600 g/kg Brush-off®	10 g in 100 L of water	Apply to actively growing plants after full leaf expansion but before seed set. Add surfactant.
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L Grazon Extra®	350 mL in 100 L of water	Apply as foliar spray pre-flowering
Triclopyr 300 g/L + Picloram 100 g/L Grazon® DS	350 mL in 100 L of water	Apply as a foliar spray pre-flowering.
Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
Metsulfuron-methyl 300 g/kg + Aminopyralid 375 g/kg Stinger™	20 g in 100 L of water	Hand gun application.

## Johnson grass – *Sorghum halepense*

**Non-chemical options:** Cultivation is ineffective because of rhizome segmentation. Digging out individual plants may be an option, taking care to remove all rhizome material.

Chemical and Concentration	Rate	Comments
<b>Glyphosate</b> 360 g/L Roundup®	1.0 L per 100 L of water	Spot spray.
<b>Glyphosate</b> 360 g/L Roundup®	6.0 L/ha	Boom spray. Actively growing plants at early head stage.
<b>Glyphosate</b> 360 g/L Roundup®	1.0 L glyphosate per 2 L of water	Wiper equipment.
<b>Imazapyr</b> 750 g/kg Various products	2 kg/ha	Boom spray application
<b>MSMA</b> 720 g/L Armada 720 SL	1.1 L per 100 L of water	Spot spraying.
<b>MSMA</b> 720 g/L Armada 720 SL	11–13.3 L/ha in 500 L of water	Boom spraying.
<b>Flupropanate</b> 745 g/L Tussock®	200 mL per 15 L of water	Knapsack spray.
<b>Flupropanate</b> 745 g/L Tussock®	1.0 L per 100 L of water	High volume spot spray.
<b>Flupropanate</b> 745 g/L Tussock®	12.0 L/ha	Boom spray.
<b>Haloxypop</b> 520 g/L Verdict®	200–400 mL/ha	Boom spray application

## Khaki weed – *Alternanthera pungens*

**Non-chemical options:** Improve lawns and turf density to create competition, grub at least 50 mm of the root.

Chemical and Concentration	Rate	Comments
<b>2,4-D amine</b> 625 g/L Amicide® 625	1.1–2.2 L/ha	Seedlings only.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL in 100 L of water	Active growth in full leaf.
<b>Amitrole</b> 250 g/L + <b>Ammonium thiocyanate</b> 220 g/L Various products	1.1 L in 100 L of water	Spot spray. Actively growing plants.
<b>2,4-D LV ester</b> 680g/L Various products	800 mL to 1.15 L per hectare	Boom spray application for young seedlings
PER12362 <b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	2 L/ha	Boom spray application.

## Kidney-leaf mud plantain – *Heteranthera reniformis*

Kidney-leaf mud plantain is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small individual plants can be carefully manually removed.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	200 mL per 10 L of water	Foliar application
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Foliar application in terrestrial situations only.

## Kudzu – *Pueraria lobata*

Kudzu is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Continual grazing or cutting can kill the plant. Manual removal is difficult because of the existence of a large underground tuber.

	Chemical and Concentration	Rate	Comments
PER11604	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Foliar application from spring to autumn. For further information read the permit critical use comments.
PER11604	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Foliar application from spring to autumn. For further information read the permit critical use comments.

## Lacy ragweed – *Ambrosia tenuifolia*

**Non-chemical options:** A perennial plant reproducing from seed and root, making physical removal unpractical. In some situations, biological agents may give some control.

	Chemical and Concentration	Rate	Comments
	<b>Dicamba</b> 500 g/L Kamba®	600 mL per 100 L of water	High volume spot spray.
	<b>Dicamba</b> 500 g/L Kamba®	8.8 L/ha	Use a minimum of 1500 L /ha of water. Add a surfactant.

## Lantana – *Lantana* species

Lantana is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Manual control can be effective by slashing, burning or manual removal, integrated together with pasture improvement. Biological control research is continuing.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL or 500 mL in 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 or 500 mL per 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300–600 mL per 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m.
<b>Fluroxypyr</b> 200 g/L Starane™	500 mL or 1.0 L per 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL per 100 L of water	Seedlings and regrowth 0.5–1.2 m height. Apply to actively growing plants.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	700 mL per 100 L of water	Mature plants and regrowth 1.2–2.0 m. Apply to actively growing plants.
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g in 100 L of water	Hand gun application.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 60 L of diesel	Basal bark application for basal diameter less than 5 cm or cut stump application above 5 cm.
<b>Glyphosate</b> 360 g/L Roundup®	10 g metsulfuron-methyl plus 200 mL glyphosate per 100 L of water	Apply to bushes up to 2 m high. Thoroughly wet all foliage and stems. Add organosilicone penetrant.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Apply to bushes up to two metres tall. Spray to wet all foliage and stems. Re-treatment will be necessary.
<b>2,4-D amine</b> 625 g/L Amicide® 625	320 mL in a 100 L of water	Apply to actively growing bushes.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Glyphosate</b> 360 g/L Roundup®	1 part per 9 parts water	Gas gun/Splatter gun application. Apply 2 x 2 mL doses per 0.5 m of bush height
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark or cut stump application.
<b>Glyphosate</b> 835 g/kg + <b>Metsulfuron-methyl</b> 10 g/kg Trounce®	1 measured pack (173 g) per 100 L of water	Apply when actively growing, thoroughly wet all foliage and stems. Do not apply during stress periods.
<b>Glyphosate</b> 360 g/L Roundup®	1.0 L per 100 L of water	Actively growing with full foliage. Avoid summer stress.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	High volume spot spray. Thoroughly wet foliage and soil around the base of plant during March to May.
<b>Dichlorprop</b> 600 g/L Lantana 600®	1.0 L per 200 L of water	Spot spray application, completely wet all leaves and stems.

## Leafy elodea – *Egeria densa*

**Non-chemical options:** Small infestations can be mechanically removed.

Chemical and Concentration	Rate	Comments
<b>Diquat</b> 200 g/L Reglone®	5 L /megalitre water	Apply by injection below the surface or as a surface spray.

## Leucaena – *Leucaena leucocephala*

**Non-chemical options:** Small plants can be mechanically removed.

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Cut stump/basal bark application.

## Lippia – *Phyla canescens*

**Non-chemical options:** Pasture improvement and grazing management. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

Chemical and Concentration	Rate	Comments
<b>Dichlorprop</b> 600 g/L Lantana 600®	5 mL per 1 L of water	Knapsack rate. Completely wet plants.
<b>Dichlorprop</b> 600 g/L Lantana 600®	1.0 L per 200 L of water or 5.0 L/ha	Boomspray using high water volumes. Minimum application of 100 L/ha. For best results spray at flowering when there is good soil moisture.
PER14197 <b>2,4-D amine</b> 625 g/L Amicide® 625	1.7–3.1 L/ha plus 1% crop oil	Pastoral land situation. Apply when Lippia is in a fresh condition, mid-flower, with good soil moisture present.

## Long-leaf willow primrose – *Ludwigia longifolia*

Long-leaf willow primrose is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small plants may be manually removed, taking care not to spread seed.

Chemical and Concentration	Rate	Comments
PER14731 <b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1.0 L per 100 L of water	Spot spray application.

## Long-style feather grass – *Pennisetum villosum*

**Non-chemical options:** Cultivate and establish pasture cover to provide competition and prevent invasion.

Chemical and Concentration	Rate	Comments
PER9792 <b>Flupropanate</b> 745 g/L Tussock®	300 mL per 100 L of water	Spot spray application
PER9792 <b>Glyphosate</b> 360 g/L Roundup®	335 mL in 100 L of water	Spot spray application. Apply when plant is actively growing.

## Ludwigia – *Ludwigia peruviana*

Ludwigia is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small plants can be manually removed. Dense stands can be slashed and burnt. Take care not to spread the seed.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1 L in 100 L of water	Actively growing at or beyond the early bloom stage of growth but before autumn change of colour. Thorough coverage is necessary for best results.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER10597	<b>2,4-D amine</b> 500 g/L Various products	125 mL in 100 L of water	Apply as direct application to foliage, minimising runoff from leaf surface. Do not apply as a broadcast spray over water.

## Madeira vine – *Anredera cordifolia*

Madeira vine is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small seedlings and tubers can be manually removed, bagged and composted.

	Chemical and Concentration	Rate	Comments
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL in 100 L of water	Apply at times of active growth. Avoid drift on to desirable plants.
	<b>Fluroxypyr</b> 200 g/L Starane™	500 mL in 100 L of water	Apply at times of active growth. Avoid drift on to desirable plants.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	Undiluted glyphosate	Stem scraping application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	100 mL glyphosate per 10 L of water	Spot spray for seedling control. Add a surfactant.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 1.5 g metsulfuron-methyl in 10 L of water	Spot spray for seedling control.
PER13914	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	400 mL in 100L of water	Handgun application
PER13914	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	400 mL in 100L of water	Handgun application.

## Mahonia – *Berberis lomariifolia*

**Non-chemical options:** Small individual plants can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	400 mL of glyphosate in 600 mL of water	Cut stump application



## Mesquite – *Prosopis* species

Mesquite is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Blade ploughing and fire on dense infestations. Grazing management and grubbing to prevent reinfestation.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL in 100 L of water	Controls seedlings, plants in full leaf and flowering before podding. Thoroughly wet all foliage, stems and soil around the base of the plants. Add a wetting agent to increase efficacy. Do not spray plants bearing pods.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 mL in 100 L of water	Controls seedlings, plants in full leaf and flowering before podding. Thoroughly wet all foliage, stems and soil around the base of the plants. Add a wetting agent to increase efficacy. Do not spray plants bearing pods.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark application of plants up to 5 cm in diameter. Cut stump for plants over 5 cm.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Miconia – *Miconia* species

Miconia is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Physical removal gives best results.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907 <b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate per 1.5 parts water	Cut stump or stem-scraping application.

## Mimosa bush – *Vachellia farnesiana*

**Non-chemical options:** Small plants can be mechanically removed.

Chemical and Concentration	Rate	Comments
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	1 L in 55 L of Diesel	Basal bark application
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Cut stump/basal bark application.
PER13891 <b>Tebuthiuron</b> 200 g/kg Graslan®	2 g/square m <sup>2</sup>	Read and follow permit and label instructions thoroughly
PER14929 <b>Clopyralid</b> 300 g/L Lontrel®	500 mL in 100 L of water	High volume foliar application. Apply to actively growing plants in full leaf. Add a surfactant.

## Ming asparagus fern – *Asparagus macowanii* var. *zuluensis*

Ming asparagus fern is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate in 50 parts water	Spot spray application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate in 1.5 parts water	Cut stump/scrape stem application
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1–2 g in 10 L of water, plus a non-ionic surfactant	Spot spray application

## Mintweed – *Salvia reflexa*

**Non-chemical options:** To prevent invasion, maintain a strong, competitive pasture.

	Chemical and Concentration	Rate	Comments
	<b>2,4-D amine</b> 625 g/L Amicide® 625	1.1 mL/ha	Boom spray application
	<b>MCPA</b> 500 g/L Various products	2.0 L/ha	Boom spray application for actively growing seedlings.
	<b>Glyphosate</b> 360 g/L Roundup®	500–700 mL per 100 L of water	High volume spot spray.
	<b>Glyphosate</b> 360 g/L Roundup®	2.0–3.0 L/ha	Boom spray. Apply to actively growing plants.

## Mistflower – *Ageratina riparia*

**Non-chemical options:** Improved pastures and well-managed grazing will assist control.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL in 100 L of water	Foliar application from spring to autumn on actively growing bushes
	<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	700 mL per 100 L of water	Apply to actively growing plants from October to April.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 mL per 100 L of water	Spring to autumn on actively growing bushes.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL per 100 L of water	Actively growing bushes.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	5 g per 100 L of water	Apply when bush is actively growing and before flowering.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL in 100 L of water	Apply to actively growing seedlings and young plants before flowering
	<b>Fluroxypyr</b> 200 g/L Starane™	500 mL per 100 L of water	Actively growing seedlings and young bushes before flowering.
	<b>Glyphosate</b> 360 g/L Roundup®	5 mL per 1 L of water	Actively growing bushes with full foliage.
	<b>Glyphosate</b> 360 g/L Roundup®	1.0 L per 9 L water (3 mL per m <sup>2</sup> )	Low volume application.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	10 g per 100 L of water	Hand gun application.

## Montbretia – *Crocsmia x crocosmiiflora*

**Non-chemical options:** A member of the bulb group of plants. Physical removal will be difficult because of the number of bulblets attached to the main bulb.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1.0 L in 50 L of water	Spray between flowering and fruiting.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate per 1 part water	Weed wand application.

## Morning glory – coastal – *Ipomoea cairica*

**Non-chemical options:** Small seedlings can be manually removed. Vines and runners can be collected and destroyed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Dichlorprop</b> 600 g/L Lantana 600®	1 L in 200 L of water	Completely wet all leaves and stem of target plants
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL per 10 L of water	Spot-spray for seedling control.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate per 1.5 parts water	Stem scraping application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 1.5g of metsulfuron-methyl in 10 L water	Spot spray application
PER12367	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	50 mL/10 L water	Spot spray application
PER12367	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	50 mL/10 L water	Spot spray application

## Morning glory – purple – *Ipomoea indica*

**Non-chemical options:** Small seedlings can be manually removed. Vines and runners can be collected and destroyed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Dichlorprop</b> 600 g/L Lantana 600®	1 L in 200 L of water	Completely wet all leaves and stem of target plants
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL per 10 L of water	Spot-spray for seedling control.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate per 1.5 parts water	Stem scraping application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 1.5 g of metsulfuron-methyl in 10 L water	Spot spray application
PER12367	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	50 mL/10 L water	Spot spray application
PER12367	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	50 mL/10 L water	Spot spray application

## Moth vine – *Araujia sericifera*

**Non-chemical options:** Physical removal of young plants; bag and remove any fruit.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL per 10 L of water	Treat seedling plants.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Stem cut, scrape and paint application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	2 L glyphosate plus 15 g metsulfuron-methyl in 100 L water	Spot spray
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10–20 g per 100 L of water	Spot spray

## Mother-of-millions – *Bryophyllum* spp.

**Non-chemical options:** For best results maintain strong pasture competition.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply at flowering, add a surfactant.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Apply at flowering, add a surfactant.
	<b>2,4-D</b> 300 g/L Affray 300®	70 mL in 10 L of water	Thorough even coverage of leaves
	<b>2,4-D amine</b> 625 g/L Amicide® 625	400 mL per 100 L of water	Thorough, even coverage of leaves and plantlets is necessary. Add a wetting agent.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	360 mL in 100 L of water	Apply to actively growing seedlings and young plants before flowering
	<b>Fluroxypyr</b> 200 g/L Starane™	600 mL per 100 L of water	Actively growing seedlings and young plants before flowering.
PER14877	<b>Glyphosate</b> 360 g/L Roundup®	10 g metsulfuron-methyl plus 200 mL glyphosate in 100 L of water	Apply just prior to flowering, add a surfactant.

## Muraya – *Muraya paniculata*

**Non-chemical options:** Seedlings may be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL per 10 L of water	Foliar application for seedlings/ coppice shoots.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Stem injection/cut stump application, saplings to large shrubs.

## Mysore thorn – *Caesalpinia decapetala*

**Non-chemical options:** Physical removal of small seedling plants.

Chemical and Concentration	Rate	Comments
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Spray to thoroughly wet all foliage, but not to cause run off. Apply to actively growing plants before flowering. Add wetting agent.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Hand gun application.

## Nodding thistle – *Carduus nutans*

**Non-chemical options:** Good perennial pastures with sound grazing management.

Chemical and Concentration	Rate	Comments
<b>MCPA</b> 500 g/L Various products	250 mL per 150 L of water	Spot spray application
<b>MCPA</b> 500 g/L Various products	2.5 L /ha	Boom spray application, at early rosette stage, re-treatment is required.
<b>Clopyralid</b> 300 g/L Lontrel®	250 mL clopyralid per 100 L of water	Spray at rosette to pre-flowering.
<b>Clopyralid</b> 300 g/L Lontrel®	50 or 70 mL clopyralid plus 1.0–1.5 L of MCPA /ha	Boom spray. Spray at rosette to pre-flowering.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application
<b>2,4-D LV ester</b> 680g/L Various products	1.15 to 17 L per hectare	Boom spray application, rosette to preflowering

## Noogoora burr – *Xanthium occidentale*

**Non-chemical options:** Noogoora burr in the seedling form is toxic to livestock. Hoeing, chipping or slashing will give control.

Chemical and Concentration	Rate	Comments
<b>2,4-D amine</b> 625 g/L Amicide® 625	800 mL–1.1 L/ha	Seedlings only.
<b>MCPA</b> 500 g/L Various products	1.0–2.0 L/ha	Spray young seedlings only.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	7.5 g per 100 L of water	Apply to actively growing plants. Do not apply to plants under stress.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	45 mL in 100 L of water	Apply to actively growing plants. Seedlings and young plants to 40 cm high.
<b>Fluroxypyr</b> 200 g/L Starane™	75 mL per 100 L of water	Apply to actively growing plants. Seedlings and young plants to 40 cm high.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	1.0 L/ha	Boom spray application
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	14 g per 100 L of water	Hand gun application.
<b>2,4-D LV ester</b> 680g/L Various products	1.7 to 3.3 L per hectare	Boom spray application from seedlings to preflowering

## Ochna – *Ochna serrulata*

**Non-chemical options:** Small seedlings can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	600 mL in 100 L of water	Spot spray, Apply to plants up to 2 m tall
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL per 10 L of Water	Gas gun application to plants up to 1 m.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate per 10 L of water	Spot spray. Apply to seedlings/ coppice shoots and shrubs.
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 part glyphosate per 1.5 parts of water	Scrape stem, cut, and paint. Cut stump saplings. Stem injection large trees and shrubs.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 1.5g metsulfuron-methyl per 10 L of water	Spot spray application.

## Oleander – *Nerium oleander*

**Non-chemical options:** Manually remove plants with care, as all parts are highly toxic to both humans and livestock.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark application plants up to 5 cm basal diameter. Cut stump application plants over 5 cm.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Onion weed – *Asphodelus fistulosus*

**Non-chemical options:** Good pasture management will combat invasion by onion weed.

	Chemical and Concentration	Rate	Comments
	<b>Amitrole</b> 250 g/L + <b>Ammonium thiocyanate</b> 220 g/L Various products	1.1 L per 100 L of water	Active growth before flowering. Repeat treatments will be required.

## Pampas grass – *Cortaderia* species

**Non-chemical options:** Mechanical removal, wherever possible, is best.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	1.0 or 1.3 L per 100 L of water	Actively growing plants, before flowering, spring to autumn. Use higher rate on plants over 1 m high.

## Paper mulberry – *Broussonetia papyrifera*

Paper mulberry is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small individual plants can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	400 mL of glyphosate in 600 mL of water	Cut stump application

## Parkinsonia – *Parkinsonia aculeata*

Parkinsonia is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanical removal or grubbing gives effective control.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark or cut stump application.
	<b>Hexazinone</b> 250 g/L Velpar® L	4 mL per spot	One spot per bush up to 5 m tall.
	<b>Hexazinone</b> 250 g/L Velpar® L	1 mL per spot	One spot per bush up to 1 m tall. Do not use near desirable plants.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Parthenium weed – *Parthenium hysterophorus*

Parthenium weed is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Clean all vehicles and machinery. Maintain competitive crops and pastures. Do not spread the seed if removing by hand.

	Chemical and Concentration	Rate	Comments
	<b>Dicamba</b> 500 g/L Kamba®	40 mL per 100 L of water	Spot spray.
	<b>Dicamba</b> 500 g/L Kamba®	600 mL/ha	Boom spray. Apply to young, actively growing plants.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	125 mL per 100 L of water	Spot spray. Rosette stage when plants are actively growing.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	3.0 L/ha	Boom application.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	5 g per 100 L of water	Thoroughly wet all foliage to the point of run-off.
	<b>Hexazinone</b> 250 g/L Velpar® L	70 mL per 100 L of water	Apply uniformly over the area. When spraying single plants treat soil for 1 m around. Do not use near desirable trees.
	<b>Atrazine</b> 900 g/kg Various products	3.3 L/ha	Protects against emerging seedlings.
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	10 g per 100 L of water	Hand gun application.

## Paterson's curse – *Echium plantagineum*

**Non-chemical options:** Control can be achieved by using spray graze, pasture improvement and good grazing management practices and by the use of biological control agents. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	250 mL in 100 L of water	Spot spray from rosette to flowering plants
<b>2,4-D amine</b> 625 g/L Amicide® 625	170–220 mL in 150 L of water	Spot spray. Young rosettes.
<b>2,4-D amine</b> 625 g/L Amicide® 625	1.7–2.2 L/ha	Boom spray.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	150 mL in 100 L of water	Spot spray. Rosettes to pre-flowering.
<b>Glyphosate</b> 360 g/L Roundup®	500–700 mL in 100 L of water	Spot spray. Actively growing plants.
<b>Glyphosate</b> 360 g/L Roundup®	2.0–3.0 L/ha	Boom application
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	5 g in 100 L of water	Apply to rosettes after full leaf expansion but before head emergence. Do not spray after emergence of first flowers, as seed set has occurred.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10–15 g/ha	Apply to rosettes after full leaf expansion but before head emergence. Do not spray after emergence of first flowers, as seed set has occurred.
<b>MCPA</b> 500 g/L Various products	1.0–1.5 L/ha	Apply at early rosette stage
<b>Dicamba</b> 500 g/L Kamba®	280 mL per 100 L of water.	Spot spray.
<b>Dicamba</b> 500 g/L Kamba®	4.0 L/ha	Boom spray. Apply prior to flowering. Add wetting agent.
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	10 g per 100 L of water	Hand gun application.

## Pellitory – *Parietaria judaica*

**Non-chemical options:** Hand removal before flowering. Flowering plants can cause respiratory problems in humans.

Chemical and Concentration	Rate	Comments
<b>Glyphosate</b> 360 g/L Roundup®	1.0 L in 100 L of water	Apply to actively growing plants before flowering. Re-treatments may be required to control seedlings.

## Perennial ragweed – *Ambrosia psilostachya*

**Non-chemical options:** Physical removal is not totally effective because of the root system.

Chemical and Concentration	Rate	Comments
<b>Dicamba</b> 500 g/L Kamba®	600 mL in 100 L of water	Spot spray. Active growth, small rosettes.
<b>Dicamba</b> 500 g/L Kamba®	8.8 L/ha	Boom application.



## Perennial thistle – *Cirsium arvense*

**Non-chemical options:** Cultivation is ineffective in controlling this plant because of the perennial root system.

Chemical and Concentration	Rate	Comments
Dicamba 500 g/L Kamba®	280 mL per 100 L of water	Spot spray. Young, actively growing plants.
Dicamba 500 g/L Kamba®	4 L/ha	Boom spray.
2,4-D amine 625 g/L Amicide® 625	320–380 mL per 100 L of water	Spot spray.
2,4-D amine 625 g/L Amicide® 625	3.2–3.8 L/ha	Boom spray. Rosettes to early budding stage.
2,4-D 300 g/L + Picloram 75 g/L Tordon® 75-D	650 mL per 100 L of water	Spot spray. Spray at budding stage.
Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application.

## Prairie ground cherry – *Physalis hederifolia*

**Non-chemical options:** Cultivation is ineffective because of the perennial root system.

Chemical and Concentration	Rate	Comments
Amitrole 250 g/L + Ammonium thiocyanate 220 g/L Various products	1.1 L in 100 L of water	Spot spray. Active growth before flowering.

## Prickly acacia – *Acacia nilotica*

Prickly acacia is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanical or chain removal in both directions.

Chemical and Concentration	Rate	Comments
Fluroxypyr 333 g/L Starane™ Advanced	450 mL in 100 L of water	Spot spray, seedlings and young plants up to 2 m tall
Fluroxypyr 333 g/L Starane™ Advanced	900 mL per 100 L of diesel	Basal bark cut stump application
Triclopyr 600 g/L Garlon® 600	1.0 L in 120 L of diesel	Basal bark/cut stump application.
Triclopyr 240 g/L + Picloram 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark/cut stump application.
Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.

## Prickly pears – *Opuntia* species

### Common pest pear – *Opuntia stricta*

**Non-chemical options:** The use of Cochineal and Cactoblastis biological control agents suited to the variety of pear is the best management practice, where appropriate.

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L in 75 L of distillate.	Apply as a thorough foliar spray.
<b>Triclopyr</b> 600 g/L Garlon® 600	3.0 L in 100 L of water	Apply as a thorough foliar spray.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply as a thorough foliar spray
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL in 100 L of water	Apply as a thorough foliar spray.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of distillate	Foliar application; thoroughly wet plants.

### Smooth tree pear – *Opuntia monacantha*

**Non-chemical options:** The use of Cochineal and Cactoblastis biological control agents suited to the variety of pear is the best management practice, where appropriate.

Chemical and Concentration	Rate	Comments
PER14442 <b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 75 L of distillate	Apply thoroughly as a foliar spray.
PER14442 <b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply as a thorough foliar spray
PER14442 <b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Common pear and smooth tree pear, with active phyllode (leaf) growth.

### Tiger pear – *Opuntia aurantiaca*

**Non-chemical options:** The use of Cochineal and Cactoblastis biological control agents suited to the variety of pear is the best management practice, where appropriate.

Chemical and Concentration	Rate	Comments
<b>Triclopyr</b> 600 g/L Garlon® 600	3.0 L per 100 L of water	Apply thoroughly as a foliar spray.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 75 L of distillate	Apply thoroughly as a foliar spray.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Apply thoroughly as a foliar spray.
PER14442 <b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply as a thorough foliar spray
PER14442 <b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Apply as a thorough foliar spray

## Tree pear – *Opuntia tomentosa*

**Non-chemical options:** The use of Cochineal and Cactoblastis biological control agents suited to the variety of pear is the best management practice, where appropriate.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1 L per 60 L of diesel	Apply thoroughly as a foliar spray.
PER14442	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Apply as a thorough foliar spray
PER14442	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 100 L of water	Apply as a thorough foliar spray

## Privet – broad-leaf – *Ligustrum lucidum*

Privet – broad-leaf is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small plants and seedlings can be manually controlled.

	Chemical and Concentration	Rate	Comments
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Apply to bushes up to 3 m high; complete coverage is essential.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Apply only to bushes up to 3 m high when in full leaf and actively growing. Thorough coverage is essential.
	<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>Glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) per 100 L of water	Apply to bushes up to 3 m high, in full leaf and actively growing; complete coverage is essential.
	<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 12 L of diesel	Basal bark/cut stump application.
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 30 L of diesel	Basal bark/cut stump application.
	<b>Glyphosate</b> 360 g/L Roundup®	Undiluted (1–2 mL per cut)	Stem injection technique, as per label.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Hand gun application.

## Privet – European – *Ligustrum vulgare*

**Non-chemical options:** Small plants and seedlings can be manually controlled.

Chemical and Concentration	Rate	Comments
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Apply to bushes up to 3 m high; complete coverage is essential.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Apply only to bushes up to 3 m high when in full leaf and actively growing. Thorough coverage is essential.
<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>Glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) per 100 L of water	Apply to bushes up to 3 m high, in full leaf and actively growing; complete coverage is essential.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 12 L of diesel	Basal bark/cut stump application.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 30 L of diesel	Basal bark/cut stump application.
<b>Glyphosate</b> 360 g/L Roundup®	Undiluted (1–2 mL per cut)	Stem injection technique, as per label.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Hand gun application.

## Privet – narrow-leaf – *Ligustrum sinense*

Privet – narrow-leaf is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small plants and seedlings can be manually controlled.

Chemical and Concentration	Rate	Comments
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g per 100 L of water	Apply to bushes up to 3 m high; complete coverage is essential.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Apply only to bushes up to 3 m high when in full leaf and actively growing. Thorough coverage is essential.
<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>Glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) per 100 L of water	Apply to bushes up to 3 m high, in full leaf and actively growing; complete coverage is essential.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 12 L of diesel	Basal bark/cut stump application.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 30 L of diesel	Basal bark/cut stump application.
<b>Glyphosate</b> 360 g/L Roundup®	Undiluted (1–2 mL per cut)	Stem injection technique, as per label.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20 g per 100 L of water	Hand gun application.

## Ragwort – *Senecio jacobaea*

**Non-chemical options:** Physically remove individual plants.

Chemical and Concentration	Rate	Comments
MCPA 340 g/L + Dicamba 80 g/L Kamba®	190–270 mL per 100 L of water	Spot spray.
MCPA 340 g/L + Dicamba 80 g/L Kamba®	2.8–4.0 L/ha	Boom spray. Apply at the young growth stage.
2,4-D 300 g/L + Picloram 75 g/L Tordon® 75-D	300 mL per 100 L of water	Spot spray application.
2,4-D 300 g/L + Picloram 75 g/L Tordon® 75-D	3.5 L/ha	Boom application, rosettes to cabbage stage.
Dicamba 500 g/L Kamba®	280 mL per 100 L of water	Spot spray application.
Dicamba 500 g/L Kamba®	4.0 L/ha	Boom application, actively growing rosettes.
Metsulfuron-methyl 300 g/kg + Aminopyralid 375 g/kg Stinger™	10g per 100 L water	Handgun application
Metsulfuron-methyl 300 g/kg + Aminopyralid 375 g/kg Stinger™	10 g per 100 L of water	Hand gun application.
Metsulfuron-methyl 600 g/kg Brush-off®	5 g per 100 L of water	Spot spray application.
Metsulfuron-methyl 600 g/kg Brush-off®	15 g/ha	Boom application, actively growing rosettes to cabbage stage.
Triclopyr 300 g/L + Picloram 100 g/L Grazon® DS	350 or 500 mL per 100 L of water	Spot spray. Apply to actively growing plants.

## Rhizomatous bamboo – *Phyllostachys* species

**Non-chemical options:** Physical removal will give best results.

Chemical and Concentration	Rate	Comments
PER9907 Glyphosate 360 g/L Roundup®	200 mL per 10 L of water	Spot spray application.
PER9907 Glyphosate 360 g/L Roundup®	1 part per 1.5 parts of water	Cut stump application.

## Rhus tree – *Toxicodendron succedaneum*

**Non-chemical options:** When manually removing this tree avoid contact with the sap. Do not mulch or chip for garden use.

Chemical and Concentration	Rate	Comments
Glyphosate 360 g/L Roundup®	Undiluted (1–2 mL per cut)	Stem injection technique, as per label.
Glyphosate 360 g/L Roundup®	1 part glyphosate to 1 part water	Cut stump application.
Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Rubber vine – *Cryptostegia grandiflora*

Rubber vine is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Seedling plants may be manually removed.

Chemical and Concentration	Rate	Comments
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	15 g per 100 L of water	Hand gun application. Do not apply to bushes more than 3 m tall. Apply October to April, ensuring thorough spray coverage of all foliage.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark and cut stump application.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L per 60 L of diesel	Basal bark and cut stump application.
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 or 500 mL in 100 L of water	Hand gun application

## Saffron thistle – *Carthamus lanatus*

**Non-chemical options:** Control can be enhanced by slashing or pasture improvement.

Chemical and Concentration	Rate	Comments
<b>2,4-D amine</b> 625 g/L Amicide® 625	110–170 mL per 150 L of water	Spot spray application.
<b>2,4-D amine</b> 625 g/L Amicide® 625	1.1–1.7 L/ha	Boom application, apply when in rosette stage.
<b>MCPA</b> 500 g/L Various products	100–200 mL in 150 L water	Spot spray.
<b>MCPA</b> 500 g/L Various products	1–2 L/ha	Boom spray. Apply when in rosette stage. Use higher rate for larger weeds.
<b>Clopyralid</b> 300 g/L Lontrel®	250 mL per 100 L water	Spot spray.
<b>Clopyralid</b> 300 g/L Lontrel®	50 or 70 mL clopyralid plus 1.0–1.5 L MCPA /ha	Boom spray. Actively growing rosettes; use higher rate on mature plants.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	300 mL/ha	Boom spray application for young rosette or seedling plants.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L water	Hand gun application on actively growing plants
<b>2,4-D LV ester</b> 680g/L Various products	800 mL to 2.5 L per hectare	Boom spray application up to rosette stage

## Sagittaria – *Sagittaria platyphylla*

**Non-chemical options:** Isolated plants can be manually removed.

	Chemical and Concentration	Rate	Comments
PER11856	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	10 L per 100 L of water	Spot spray application. Direct spray onto weed mats in infested areas. Do not broadcast spray over the water.
PER14549	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	10 L per 100 L of water	Spot spray application. Direct spray onto weed mats in infested areas. Do not broadcast spray over the water.

## Salvinia – *Salvinia molesta*

Salvinia is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Physical removal of small infestations, the use of biological control agents where appropriate, and reduction of nutrient inflows will all help with control.

	Chemical and Concentration	Rate	Comments
	<b>Orange oil</b> 55.2 g/kg Water Clear®	1.0 L per 100 L of water	Spray on to free-floating plants.
	<b>Diquat</b> 200 g/L Reglone®	400 mL per 100 L of water	Spot spray to wet all foliage thoroughly, add Agral 600. Observe withholding period.
	<b>Diquat</b> 200 g/L Reglone®	5.0–10.0 L/ha	Boom spray to wet all foliage thoroughly, add Agral 600. Observe withholding period.
PER10461	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1.0 L per 100 L of water	Overall spray. Follow directions on specific permits.
PER14327	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1 L in 100 L of water	Hand gun application, follow directions on the permit
PER14447	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Hand gun application, add wetter, synertrol oil at 200 mL/100 L, avoid broadcast spraying over the water

## Scotch broom – *Cytisus scoparius*

**Non-chemical options:** The use of goats as a grazing management tool or the use of biological control agents offers other means of control.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	250 or 350 mL in 100 L of water	Lower rate when actively growing mid-summer to pod formation. Higher rate for autumn-winter treatment.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	250 or 350 mL per 100 L of water	Lower rate when actively growing mid-summer to pod formation. Higher rate for autumn-winter treatment.
	<b>Triclopyr</b> 600 g/L Garlon® 600	170 mL per 100 L of water	Late spring to early autumn. Actively growing bushes.
	<b>Glyphosate</b> 360 g/L Roundup®	100–130 mL per 10 L of water	Foliar spot spray application.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Scotch thistle – *Onopordum acanthium*

**Non-chemical options:** Establish a strong, perennial, grass-based pasture. Grub single plants, removing at least 50 mm of root. There are also biological control agents available.

	Chemical and Concentration	Rate	Comments
	<b>Clopyralid</b> 300 g/L Lontrel®	250 mL in 100 L of water	Handgun application
	<b>Dicamba</b> 500 g/L Kamba®	80 mL in 100 L of water	Handgun application

## Senegal tea plant – *Gymnocoronis spilanthoides*

Senegal tea plant is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Do not attempt control on your own, as it can spread very easily from dislodged fragments.

	Chemical and Concentration	Rate	Comments
PER14729	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	5–10 g per 100 L of water	Spot spray application. Do not spray directly onto water or non-target species.
PER14729	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1 L per 100 L of water	Refer to permit for critical use comments

## Serrated tussock – *Nassella trichotoma*

**Non-chemical options:** The establishment of perennial pasture together with good grazing management will assist control. Grub out single plants.

	Chemical and Concentration	Rate	Comments
	<b>Flupropanate</b> 745 g/L Tussock®	1.5–2.0 L/ha	Boom and aerial application. June to August inclusive. Four-month withholding period for blanket application.
	<b>Flupropanate</b> 745 g/L Tussock®	100–200 mL per 100 L of water	Spot spray, from September to May. Four-month withholding period for blanket application.
	<b>Glyphosate</b> 360 g/L Roundup®	0.7–1.3 L to 100 L of water	Spot spray application.
	<b>Glyphosate</b> 360 g/L Roundup®	4.0–6.0 L/ha	Boom spray. Apply to actively growing, stress-free plants.
	<b>Glyphosate</b> 360 g/L Roundup®	0.75–1.25 L/ha	Spray topping application. Apply to actively growing, stress-free plants.
PER9792	<b>Glyphosate</b> 360 g/L Roundup®	1 L per 2 L of water	Wick wiping application.

## Siam weed – *Chromolaena odorata*

Siam weed is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanical removal of isolated plants.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	210 mL in 100 L of water	Handgun application



## Sicklethorn – *Asparagus falcatus*

Sicklethorn is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Mechanically remove rhizomes where possible.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump/stem injection application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate in 50 parts water	Spot spray application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part glyphosate in 1.5 parts water	Cut stump /scrape stem application
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1–2 g in 10 L of water, plus a non-ionic surfactant	Spot spray application

## Sifton bush – *Cassina arcuata*

**Non-chemical options:** Slashing, physical removal and chaining will aid control. Soil disturbance adds to the spread of sifton bush.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Foliar application, plants need to be actively growing for optimal effect
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL in 100 L of water	Bushes need to be actively growing for optimum effect.
	<b>Glyphosate</b> 360 g/L Roundup®	1.0 or 1.3 L in 100 L of water	Apply when actively growing. Ensure complete coverage; use higher rate on bushes over 1 m high.

## Silverleaf nightshade – *Solanum elaeagnifolium*

**Non-chemical options:** The use of strong, competitive crops or pastures will give some control. Quarantine the infestation and prevent seeding. Cultivation is ineffective as it aids the spread from root pieces. Sheep can carry the seed in their digestive tract for periods of 7 days or more without affecting the germination capability. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

	Chemical and Concentration	Rate	Comments
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL in 100 L of water	Spot spray. Spray to wet thoroughly. Extend treated areas beyond the last plant for 1 m.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	15.0 L/ha	Boom spray. Apply at early flowering before berry set.
	<b>Glyphosate</b> 360 g/L Roundup®	2.0 L in 100 L of water	Apply at early flowering to berry set stage, spray thoroughly to wet. Use only with good soil moisture conditions.
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL in 100L of water	Delay applications till majority of shoots have emerged. Follow-up treatment will be required

## Singapore daisy – *Wedelia trilobata*

Singapore daisy is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small infestations can be manually removed.

	Chemical and Concentration	Rate	Comments
	Glyphosate 360 g/L Roundup®	200 mL per 10 L of water	Spot spray. Foliar application.
PER9907	Glyphosate 360 g/L Roundup®	200 mL glyphosate plus 1.5 g metsulfuron-methyl per 10 L water	Spot spray application.

## Spear thistle – *Cirsium vulgare*

**Non-chemical options:** Hoe or chip to remove small infestations.

	Chemical and Concentration	Rate	Comments
	2,4-D amine 625 g/L Amicide® 625	1.1–1.6 L/ha	Boom spray. For pastures not containing legumes. Spray young rosettes.
	Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L Grazon Extra®	150 mL in 100 L of water	Foliar application from rosette to flowering plants
	MCPA 500 g/L Various products	1.5–2.0 L/ha	Boom spray. Apply to rosettes actively growing; use higher rate on larger plants.
	Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application to actively growing plants
	2,4-D LV ester 680g/L Various products	1.15 to 2.1 L per hectare	Boom spray application, from seedling to rosette stage

## Spiny burrgrass – *incertus* – *Cenchrus spinifex*

**Non-chemical options:** A strong, competitive summer pasture will give assist with effective control. Ensure equipment hygiene is used to prevent seed dispersal and also quarantine the infestation.

	Chemical and Concentration	Rate	Comments
	Glyphosate 360 g/L Roundup®	500–700 mL in 100 L of water	High volume spot spray. Apply to actively growing plants before seeding. Glyphosate is non-selective. Apply in non-crop areas and roadsides.
	Glyphosate 360 g/L Roundup®	2.0–3.0 L/ha	Boom spray. Apply to actively growing plants before seeding. Glyphosate is non-selective. Apply in non-crop areas and roadsides.
	MSMA 720 g/L Armada 720 SL	1.0 L in 100 L of water	Spot spray application. Do not cut or graze effected area for 5 weeks.

## Spiny burrgrass – *longispinus* – *Cenchrus longispinus*

**Non-chemical options:** A strong, competitive summer pasture will give assist with effective control. Ensure equipment hygiene is used to prevent seed dispersal and also quarantine the infestation.

	Chemical and Concentration	Rate	Comments
	Glyphosate 360 g/L Roundup®	500–700 mL in 100 L of water	High volume spot spray. Apply to actively growing plants before seeding. Glyphosate is non-selective. Apply in non-crop areas and roadsides.
	Glyphosate 360 g/L Roundup®	2.0–3.0 L/ha	Boom spray. Apply to actively growing plants before seeding. Glyphosate is non-selective. Apply in non-crop areas and roadsides.
	MSMA 720 g/L Armada 720 SL	1.0 L in 100 L of water	Spot spray application. Do not cut or graze effected area for 5 weeks.

## Spiny emex – *Emex australis*

**Non-chemical options:** An autumn/winter growing plant mainly associated with winter crops; dig out single plants or encourage a dense, winter-based pasture for competition.

Chemical and Concentration	Rate	Comments
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	300 mL per 100 L of water	Spot spray. For use in grass pastures.
<b>Glyphosate</b> 360 g/L Roundup®	500–700 mL per 100 L of water	Spot spray.
<b>Glyphosate</b> 360 g/L Roundup®	2.0–3.0 L/ha	Boom spray. Young, actively growing plants.

## Spotted golden thistle – *Scolymus maculatus*

**Non-chemical options:** Encourage a dense, improved pasture.

Chemical and Concentration	Rate	Comments
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	300 mL in 100 L of water	Spot spray.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	3.5 L/ha	Boom spray. Apply to seedling and rosette stages.
<b>Dicamba</b> 500 g/L Kamba®	80 mL in 100 L of water	Hand gun application
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application

## St. Barnaby's thistle – *Centaurea solstitialis*

**Non-chemical options:** Encourage strong, legume-based pasture to provide competition. Slashing, if timed right, is effective.

Chemical and Concentration	Rate	Comments
<b>Glufosinate-ammonium</b> 200 g/L Basta®	1.5–5.0 L/ha	Boom spray. Actively growing rosettes.
<b>Glufosinate-ammonium</b> 200 g/L Basta®	500 mL in 100 L of water	Hand gun application
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application
<b>2,4-D LV ester</b> 680g/L Various products	1.15–1.7 L per Hectare	Boom spray application

## St. John's wort – *Hypericum perforatum*

**Non-chemical options:** The use of perennial pastures and grazing management, together with the use of biological control agents, will offer some control.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	500 mL in 100 L of water	Foliar application from late spring to early summer, during flowering to early seed set
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	2.0–4.0 L/ha	Boom spray
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL in 100 L of water	Late spring to early summer, during flowering to early seed set.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	2.0–4.0 L/ha	Boom spray.
<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 mL in 100 L of water	Foliar application from flowering to early seed set. Observe withholding period.
<b>Fluroxypyr</b> 200 g/L Starane™	500 mL in 100 L of water	Spring to mid summer application.
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.
<b>Fluroxypyr</b> 200 g/L Starane™	3.0 L/ha	Boom application. Observe withholding period.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	700 mL in 100 L of water	Foliar application from flowering to early seed set
<b>Glyphosate</b> 360 g/L Roundup®	3.0 L/ha	Apply November to May, flowering to post-flowering.
<b>2,4-D LV ester</b> 680g/L Various products	3.3–4.7 L/ha	For use in grass pastures, before flowering, when the plants are less than 40 cm high.
<b>Glyphosate</b> 835 g/kg + <b>Metsulfuron-methyl</b> 10 g/kg Trounce®	1 measured pack (173 g) in 100 L of water	Actively growing from spring to summer.
<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate plus 10g metsulfuron-methyl in 100 L of water	Spray to wet, but not to cause run-off.

## Star thistle – *Centaurea calcitrapa*

**Non-chemical options:** Hoe or chip, removing at least 50 mm of the root; improve the pasture stand.

Chemical and Concentration	Rate	Comments
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	300–500 mL in 100 L of water	Spot spray. Seedling to rosette stage. Use higher rate on older rosettes.
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	3.5–7.5 L/ha	Boom spray application. Use higher rate on older rosettes.
<b>Dicamba</b> 500 g/L Kamba®	100 mL in 100 L of water	Spot spray. Seedlings to young, mature rosettes.
<b>Dicamba</b> 500 g/L Kamba®	1.6 L/ha	Boom application.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application
<b>2,4-D LV ester</b> 680g/L Various products	1.15 to 1.7 L per hectare	Boom spray application, seedling to rosette stage

## Stemless thistle – *Onopordum acaulon*

**Non-chemical options:** Establish a strong, perennial, grass-based pasture. Grub single plants, removing 50 mm of root. There are also biological control agents available.

Chemical and Concentration	Rate	Comments
<b>Dicamba</b> 500 g/L Kamba®	80 mL in 100 L of water	Spot spray. Seedlings to young mature plants; use lower rate on seedlings and higher rate on young, mature plants.
<b>Dicamba</b> 500 g/L Kamba®	1.2 L/ha	Boom application.
<b>Fluroxypyr</b> 140 g/L + <b>Aminopyralid</b> 10 g/L Hot Shot™	500 mL in 100 L of water	Hand gun application
<b>2,4-D LV ester</b> 680g/L Various products	2.5 to 3.3 L per hectare	Boom spray application rosette stage to flowering

## Sweet briar – *Rosa rubiginosa*

**Non-chemical options:** The use of mechanical removal, grubbing or grazing with goats gives control.

Chemical and Concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 or 500 mL in 100 L of water	Foliar application for plants up to 1.5 m tall
<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 or 500 mL in 100 L of water	Full-leaf to ripe fruit prior to leaf fall. Use higher rate on bushes over 1.5 m high.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark/cut stump application.
<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	500 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.
<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L in 30 L of diesel	Basal bark/cut stump application
<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL in 100 L of water	Full leaf as an overall spray.
<b>Hexazinone</b> 250 g/L Velpar® L	Undiluted (4 mL per spot)	One spot per metre of height. Do not apply near desirable trees.
<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.
<b>Metsulfuron-methyl</b> 300 g/kg + <b>Aminopyralid</b> 375 g/kg Stinger™	20g in 100 L of water	Hand gun application
<b>Glyphosate</b> 360 g/L Roundup®	1.5–2.0 L in 100 L of water	Spray to wet all foliage, from late flowering to leaf fall. Use higher rate on bushes over 1.5 m high.
<b>Glyphosate</b> 360 g/L Roundup®	1 part per 9 parts water	Gas gun/Splatter gun application. Apply 2 by 5 mL doses per 0.5 m of bush height.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Apply to actively growing bushes to point of run. Do not apply after end of February.
<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	1 g/L + organosilicone penetrant	Gas gun/Splatter gun application. Apply during the flowering period. Ensure thorough coverage of all leaves and stems.
<b>Glyphosate</b> 835 g/kg + <b>Metsulfuron-methyl</b> 10 g/kg Trounce®	1 measured pack (173 g) in 100 L of water	Apply as close to the flowering period as possible.
<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>Glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) in 100 L of water	Apply as close to the flowering period as possible.

## Sweet pittosporum – *Pittosporum undulatum*

**Non-chemical options:** Physical removal is best.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL in 10 L of water	Foliar seedling treatment.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Cut stump/basal bark application.

## Taiwan lily – *Lilium formosanum*

**Non-chemical options:** Physical removal will be difficult because of bulb-like underground parts of the plant.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel across the cut surface on the rhizome .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	2 L glyphosate plus 15 g metsulfuron-methyl per 100 L of water	Spot spray application between flowering and fruiting.
PER9907	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10–20 g metsulfuron-methyl in 100 L of water plus surfactant	Spot spray application between flowering and fruiting.

## Tobacco bush – *Solanum mauritianum*

**Non-chemical options:** Seedlings can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 mL in 100 L of water	Foliar application from spring to autumn for plants up to 2m tall
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Cut stump application.
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 mL in 100 L of water	Foliar application from spring to autumn for plants up to 2m tall
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	500 mL per 10 L of water	Gas gun/Splatter gun application. Apply to actively growing bushes.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL glyphosate per 10 L of water	Foliar application for seedlings.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Cut stump/injection application.

## Trad – *Tradescantia fluminensis*

**Non-chemical options:** Small infestations can be manually removed and composted.

	Chemical and Concentration	Rate	Comments
	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	900 mL in 100 L of water	Foliar application. Re-treatment necessary. Young plants up to and including flowering.
	<b>Fluroxypyr</b> 200 g/L Starane™	1.5 L in 100 L of water	Foliar application. Re-treatment necessary. Young plants up to and including flowering.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted (16 g/m <sup>2</sup> )	Use a long-handled paint roller or similar making sure the foliage has been completely flattened during application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL per 10 L of water	Treat in winter or early spring. For best results, add a surfactant. Apply two sprays, 6–8 weeks apart. Repeat treatments are essential.
PER12367	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	50 mL/10 L water	Knapsack. Spray thoroughly.
PER12367	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	50 mL/10 L water	Knapsack. Spray thoroughly.

## Tree-of-heaven – *Ailanthus altissima*

**Non-chemical options:** Mechanical removal of mature trees, unless wet, will cause suckering from the broken roots.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 600 g/L Garlon® 600	1.0 L in 60 L of diesel	Basal/bark, cut-stump application.
	<b>2,4-D</b> 300 g/L + <b>Picloram</b> 75 g/L Tordon® 75-D	650 mL in 100 L of water	Foliar application, apply at full leaf.
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark/cut stump application. Dormant species, not to be treated in winter.
	<b>Glyphosate</b> 360 g/L Roundup®	10 g metsulfuron-methyl plus 200 mL glyphosate in 100 L of water	Apply to actively growing trees to point of run. Ensure all daughter plants are controlled.
	<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>Glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) in 100 L of water	Apply when trees are in full leaf and actively growing; ensure all daughter plants are treated. November to January.
	<b>Hexazinone</b> 250 g/L Velpar® L	4 mL per spot, one spot per metre of height	For use on bushes up to 3 m tall. Do not apply near desirable trees.
	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Apply to actively growing trees. Avoid spraying when stressed, when leaf fall has commenced, or after the end of February.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.

## Tropical soda apple – *Solanum viarum*

Tropical soda apple is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Seedlings can be manually controlled taking care to remove all plant and root fragments.

	Chemical and Concentration	Rate	Comments
PER12942	<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra®	350 to 500 mL in 100 L of water	Hand gun application, plus wetter
PER12942	<b>Triclopyr</b> 300 g/L + <b>Picloram</b> 100 g/L Grazon® DS	350 to 500 mL plus 10g metsulfuron in 100 L of water	Hand gun application, plus wetter
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL in 10 L of water	Spot spray application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Cut stump application
PER12942	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	2 L glyphosate plus 10g of metsulfuron in 100 L of water	Hand gun application, plus wetter
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Turkey rhubarb – *Acetosa sagittata*

**Non-chemical options:** Grub out single plants, prevent plants from seeding.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL in 10 L of water	Spot spray application
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Scrape stem application

## Tussock paspalum – *Paspalum quadrifarium*

**Non-chemical options:** Grub out single tussocks, slash to prevent seeding.

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	1.0 L per 100 L of water	Spot spray application
PER9792	<b>Flupropanate</b> 745 g/L Tussock®	500 mL in 100 L of water	Hand gun application

## Umbrella tree – *Schefflera actinophylla*

**Non-chemical options:** Seedlings can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Stem injection/cut stump application.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	200 mL per 10 L of water	Foliar application for seedlings



## Water hyacinth – *Eichhornia crassipes*

Water hyacinth is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** If practicable, small infestations can be manually removed. Care needs to be taken not to spread the weed further.

	Chemical and Concentration	Rate	Comments
	<b>Diquat</b> 200 g/L Reglone®	400 mL per 100 L of water	Add Agral 600 wetter; use clean water for best results. Observe withholding period.
	<b>Diquat</b> 200 g/L Reglone®	5.0 to 10.0 L/ha	Add Agral 600 wetter; use clean water for best results. Observe withholding period.
	<b>Amitrole</b> 250 g/L Amitrole T®	280 mL to 100 L of water	Apply prior to flowering.
	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1.0–1.3 L in 100 L of water	Apply when actively growing, at or beyond the early bloom stage. Use higher rate on dense infestations.
	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	6.0–9.0 L/ha	Apply when actively growing, at or beyond the early bloom stage. Use higher rate on dense infestations.
	<b>2,4-D</b> 300 g/L Affray 300®	1 L in 200 L of water	Avoid causing submersion of sprayed plants.
PER14447	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Hand gun application, add synertrol oil at 200 mL in 100 L of water. Avoid broadcasting the spray over the water

## Water lettuce – *Pistia stratiotes*

Water lettuce is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Physical removal of small infestations can be effective.

	Chemical and Concentration	Rate	Comments
	<b>Diquat</b> 200 g/L Reglone®	400 mL per 100 L of water	Add Agral 600 wetter, use clean water for best results. Observe withholding period.
	<b>Diquat</b> 200 g/L Reglone®	5.0–10.0 L/ha	Add Agral 600 wetter, use clean water for best results. Observe withholding period.
	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1.0–1.3 L in 100 L of water	Best results are obtained from mid-summer through to winter. Use higher rate on dense infestations.
	<b>2,4-D</b> 300 g/L Affray 300®	1 L in 200 L of water	Avoid causing submersion of sprayed plants. Coverage: 200 L spray solution per 1000 square metres.
PER14447	<b>Metsulfuron-methyl</b> 600 g/kg Brush-off®	10 g in 100 L of water	Handgun application, add wetter, synertrol oil at 200 mL in 100 L of water, avoid broadcasting spray over the water

## Water lilies – *Nymphaea species*

**Non-chemical options:** Small infestations can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Diquat</b> 200 g/L Reglone®	400 mL per 100 L of water	Add Agral 600 wetter; use clean water for best results. Observe withholding period.
	<b>Diquat</b> 200 g/L Reglone®	5.0–10.0 L/ha	Add Agral 600 wetter; use clean water for best results. Observe withholding period.
	<b>Diquat</b> 20 g/L Vegetrol®	4.0 L per 100 L of water	Apply as an overall spray. Thoroughly wet foliage. Best if clean water is used; higher rate if dense weed or dirty water. Observe withholding period.
	<b>Diquat</b> 20 g/L Vegetrol®	50–100 L/ha	Apply as an overall spray. Thoroughly wet foliage. Best if clean water is used; higher rate if dense weed or dirty water. Observe withholding period.
	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	1 L to 100 L of water	Re-treat unaffected plants.

## White blackberry – *Rubus niveus*

**Non-chemical options:** Small individual plants can be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	2 L of Glyphosate plus 15 g of Brush-off in 100 L of water	Spot spray application, plus add a wetter.

## Wild radish – *Raphanus raphanistrum*

**Non-chemical options:** Maintain a well-balanced pasture with good grazing management.

	Chemical and Concentration	Rate	Comments
	<b>2,4-D amine</b> 625 g/L Amicide® 625	800 mL–1.1 L/ha	Apply to rosettes before flowering.
	<b>MCPA</b> 500 g/L Various products	1.0 L/ha	Apply to rosettes before flowering.
	<b>2,4-D LV ester</b> 680g/L Various products	800 mL per hectare	Boom spray application, up to rosette stage

## Willows – *Salix* species

**Non-chemical options:** Mechanical removal is best, ensuring that all of the root system is removed. For more information visit [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

	Chemical and Concentration	Rate	Comments
	<b>Glyphosate</b> 360 g/L Roundup®	1.0–1.3 L in 100 L of water	Spray to wet all foliage. Use the higher rate for trees 1–2 m high.
	<b>Glyphosate</b> 360 g/L Roundup®	Undiluted	Stem injection.
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 15 L of diesel	Cut stump application. Need to treat all stems.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .

## Witchweeds – *Striga* species

Witchweeds is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Witchweeds are inaccessible until they emerge, by which time it is usually too late to prevent yield losses. Rotations with trap crops that stimulate germination can be beneficial. Contact your local council weeds officer for assistance if you suspect you have found witchweed.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Fluroxypyr</b> 333 g/L Starane™ Advanced	300 to 600 mL in 100 L of water	Spot spray application

## Yellow bells – *Tecoma stans*

Yellow bells is a Class 2 Regionally Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)

**Non-chemical options:** Small trees and seedlings may be manually removed.

	Chemical and Concentration	Rate	Comments
	<b>Triclopyr</b> 240 g/L + <b>Picloram</b> 120 g/L Access™	1.0 L in 60 L of diesel	Basal bark/cut stump application.
	<b>Picloram</b> 44.7 g/L + <b>Aminopyralid</b> 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1.0 L in 50 L of water	Spray seedlings.
PER9907	<b>Glyphosate</b> 360 g/L Roundup®	1 part per 1.5 parts of water	Stem injection or cut stem application.

## Yellow burrhead – *Limnocharis flava*

Yellow burrhead is a Class 1 State Prohibited Weed that must be reported to your local council weeds officer or to the NSW Invasive Plants & Animals Enquiry Line 1800 680 244. For more information see [f](#)

**Non-chemical options:** Plants can be manually removed and carefully disposed.

	Chemical and Concentration	Rate	Comments
PER9907	<b>Glyphosate</b> 360 g/L Only products registered for aquatic use	Up to 200 mL in 10 L of water	Spot spray application

# Appendix 1: Spray calibration methods

## Calibration calculation (boom sprays)

All sprayers need to be calibrated regularly to work efficiently and economically. Regular calibration ensures the right amount of chemical will be applied to the target without costly wastage. The following templates will enable you to calculate how much chemical and water to use.

### Part A: General Information

Item of equipment to be calibrated.	
Spray tank capacity (litres).	L ⑤
Area to be sprayed.	ha ⑦
Chemical used.	

### Part B: Recording

What is the minimum desired water application rate (if any)?	L/ha
What chemical rate is to be used?	L/ha ④
Select an appropriate ground speed.	gear rpm
Record spray operation pressure.	kPa or bar
Record nozzle type and size.	type size
Record minimum boom height above target.	cm

### Part C: Measuring

Record the output from every nozzle for 1 minute.								
1 ____	2 ____	3 ____	4 ____	5 ____	6 ____	7 ____	8 ____	Total spray output ① (add all nozzles)
9 ____	10 ____	11 ____	12 ____	13 ____	14 ____	15 ____	16 ____	
17 ____	18 ____	19 ____	20 ____	21 ____	22 ____	23 ____	24 ____	
Replace nozzles that vary by more than $\pm 10\%$ from stated output.								L/min
Record actual effective spray width (metres)								m ②

## Calibration calculation (boom sprays, continued)

### Part D: Calculating

<b>Actual ground speed*</b>	$\frac{\text{Distance covered (m)} \times 3.6}{\text{Time taken (seconds)}}$	$\frac{( ) \times 3.6}{( )}$	= _____ km/h ③
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\* Determine actual ground speed by measuring a set distance, say 100 metres, under similar conditions to the area to be sprayed and timing how long it takes using the pre-determined gears and revs.

<b>① Total spray output</b> L/min	<b>② Effective spray width</b> m	<b>③ Actual ground speed</b> km/h
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<b>Water application rate</b>	$\frac{\text{①} \times 600}{\text{②} \times \text{③}}$	$\frac{( ) \times 600}{( ) \times ( )}$	= $\frac{( )}{( )}$	L/ha ⑥
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What adjustments could you make to your equipment if the water application rate were outside the range recommended on the label?

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<b>Chemical rate</b> L/ha ④	<b>Spray tank capacity</b> L ⑤
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How much chemical to mix in each tank?	$\frac{\text{④} ( ) \times \text{⑤} ( )}{\text{⑥} ( )}$ = _____ L
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How many tank loads are needed for the job?	$\text{⑦} \text{ (ha)} \times \text{⑥} \text{ (L/ha)}$ = _____ L ⑧ of spray mix	$\text{⑧} \text{ (L)} \div \text{⑤} \text{ (L)}$ = _____ tanks
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## Calibration calculation (knapsack sprayer)

### Step 1

Part A	What is the desired water application rate? (From the product label.)	L ____ / ____
Part B	Select appropriate chemical rate (from the label).	mL ____ / ____
Part C	Record the nozzle type and size (from the equipment).	Type Size
Part D	Is there a required operating pressure? If so, what is it?	Yes      No kPa or Bar ____
Part E	Tank size of equipment.	____ L
Part F	Hand-held height above target should be recorded.	____ cm above target

### Step 2

Part G	Measure out an area $10\text{ m} \times 1\text{ m}$ (this is $10\text{ m}^2$ ). This is an area of 1/1000th of a hectare ( $1\text{ ha} = 100\text{ m} \times 100\text{ m}$ ).	
Part H	Using the required pressure (or a constant pressure), time how long it takes to spray this area. (Walk at a comfortable pace, ensuring complete coverage.)	Time in seconds
Part I	Spray into a measuring jug for the same time it took to cover the $10\text{ m} \times 1\text{ m}$ area. Record this output.	____ L
Part J	You can now multiply this figure by 10, which will give a water application rate per $100\text{ m}^2$ .	$10 \times \text{____ L}$ $= \text{____} / 100\text{ m}^2$
Part K	OR you can now multiply this figure by 1000 to give a water application rate/ha.	$1000 \times \text{____} / \text{L}$ $= \text{____} / \text{ha}$

### Step 3

Part L	Does this water application rate comply with the chemical label requirements?	Yes      No
Part M	If not, suggest a way to change this rate to meet the requirements on the label. ..... .....	

# NSW no space 4 weeds



## look out for weeds

**what** plants that spread and take over  
plants you didn't plant  
unusual plants you haven't seen before

**where** gardens, paddocks, fencelines,  
waterways, bushland, roads, tracks,  
stockyards, holding paddocks, worksites

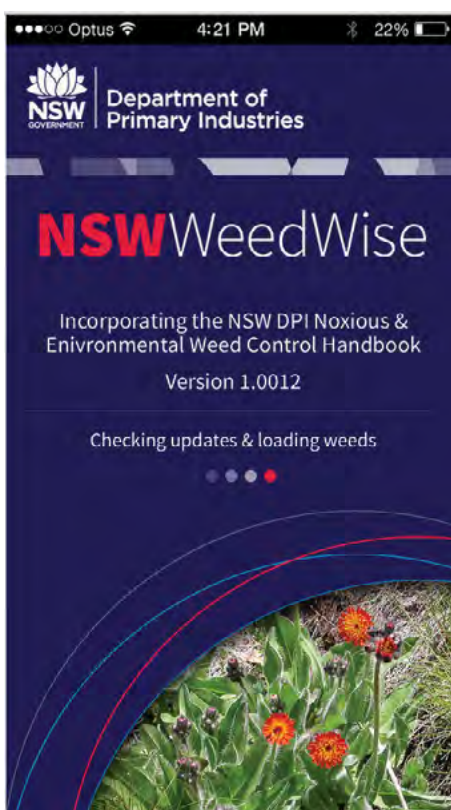
**when** when cultivating, planting and irrigating  
when moving or feeding livestock  
after floods, fires or introducing gravel,  
sand, soil or turf

**who** your local council weeds officer  
the NSW Weeds Hotline 1800 680 244  
email: [weeds@dpi.nsw.gov.au](mailto:weeds@dpi.nsw.gov.au)  
web: [www.dpi.nsw.gov.au/weeds](http://www.dpi.nsw.gov.au/weeds)



# Introducing **NSW** WeedWise – a free weeds app from NSW DPI...

Weeds wisdom is at your fingertips with profiles, legal requirements and herbicide options for noxious and environmental weeds in New South Wales, now on your smart phone.



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