African Boxthorn creates harbour for Rabbits

Vehicle hygiene prevents the spread of weeds

Large screen Smartphones – the Note with Memory-Map off-line maps is a new tool for weed mapping.

Spraying Spanish Heath

Environmental Weed Control Guidelines

Version: July 2013

CONTENTS

Introduction & Definitions

These guidelines mainly cover the control of environmental weeds or invasive weeds. However some agricultural weeds and weeds of disturbed areas are also listed, because they are controlled to protect crops or grazing land or are controlled for amenity reasons.

What are Weeds?

Weeds are plants growing where they are not wanted. There are three main types of weeds[1]:

- Weeds of Cultivation: plants in croplands, pasture or horticulture that adversely affect farm production and income.

- Weeds of Other Disturbed Sites: un-wanted plants that take advantage of disturbed areas such as gardens, lawns, amenity areas, roadsides and waterways.

- Environmental Weeds: "plants that invade native vegetation, usually adversely affecting regeneration and the survival of indigenous flora and fauna." 'Environmental Weeds' are also called 'Invasive Plants' or 'Invasive Weeds'.

There is overlap in these definitions. For instance some of the highest risk Environmental Weeds are also Weeds of Cultivation and Weeds of Other Disturbed Sites, eg. Serrated Tussock.

The highest risk Environmental Weeds form mono-cultures, completely smothering native vegetation, leading to a large loss in biodiversity. Some also increase fire danger, eg. Serrated Tussock, St John's Wort, African Lovegrass and Blackberry[2]. A number are classed by the Federal Government as Weeds of National Significance (WONS), eg. Blackberry, Brooms, Willows, African Boxthorn, Alligator Weed, Chilean Needlegrass, Serrated Tussock and Madagascan Fireweed. Most environmental weeds are alien or introduced plants from overseas (eg. Blackberry from Europe, Serrated Tussock from South America). Some are native plants that have been planted outside of their natural range (eg. Cootamundra Wattle).

In the ACT a number of environmental weeds and weeds of cultivation are listed as **Declared Pest Plants** under the Pest Plants and Animals Act 2005. These have one or more of the following categories: Notifiable, Must be Contained, Must be Supressed and Prohibited (http://www.legislation.act.gov.au/di/2009-67/current/pdf/2009-67.pdf). In NSW, plants listed under the Noxious Weeds Act 1993, are called **Noxious Weeds**.

When managing land for biodiversity protection, what matters is whether a naturalised plant is also an environmental weed. If it is an environmental weed then it is a threat to biodiversity and there should be a plan implemented to reduce the threat.

For inquiries about environmental weeds and other pest plants:

Senior Weed Management Officer
Natural Resource Protection Unit
ACT Parks & Conservation Service
Tel: 02 6207 2278
Mob: 0411 166 340

[1] Page VI of Richardson F.J, Richardson R.G & Shepherd R.C.H 2011 Weeds of the South-East, an Identification Guide for Australia Second Edition

[2] "Trials indicate Serrated Tussock burns with an intensity up to 7 times greater than grassland." - Victorian DPI. St John's Wort creates a moderate increase in fire risk. "In late summer the dry stems constitute a fire hazard." - Victorian DPI. "African Lovegrass is highly flammable and creates a fire hazard." - Eurobodalla Shire Council. Blackberry thickets increase fuel load and are a bushfire risk. - WONS Blackberry Control Manual.

Weed Control Calendar

Species or group	Treatment	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Serrated Tussock	Spraying												
	Chipping												
Chilean Needlegrass	Spraying												
	Grazing												
African Lovegrass	Spraying												
	Grazing												
St John's Wort	Spraying												
Blackberry	Spraying												
Broom/Gorse	Spraying												
	Cut/dab												
Willows	Spraying												
	Cut/dab or frill/inject												
Other woody weeds (eg. Sweet Briar)	Spraying												
	Cut/dab												
Broadleaf (eg. Patterson's Curse, Nodding Thistle)	Spraying or wick wiper												
	Chip												

Treatment month

Un-shaded — Works not recommended

Timing of spring-summer control is later in Mountain areas and earlier in Tableland areas.

If there has been a hot-dry Summer extending into Autumn – then spraying woody weeds in Autumn will fail.

WEEDeck are excellent weed identification cards www.sainty.com.au
For herbicide prescriptions, refer to the Environmental Weed Management Guidelines

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Weather & Delta-T

- Periods of low humidity and hot weather are often unsuitable for herbicide or pesticide spraying.
- A useful index published hourly by the Bureau of Meteorology is the Delta-T index. It is found at the following link: http://www.bom.gov.au/products/IDN60801/IDN60801.94926.shtmL
- Spraying of herbicides or pesticides is only recommended when the Delta-T index is between the values of 2 and 10.

Spraying Adjacent to Vineyards

Broadleaf specific herbicides are generally very dangerous around vines after budburst (from late September to May).

Herbicide	Specificity	Precautions
Dicamba, MCPA	Broadleaf (eg. Paterson's Curse, Thistle species)	Extreme caution must be taken to ensure no chemical spray drift occurs after budburst.

Unwanted Herbicide

ChemClear collect unwanted pesticide/herbicide. Information is at the following link: http://www.chemclear.com.au/.

Disposal of Empty Herbicide Containers

Contact ACT No Waste – drumMuster Tel: 6241 9411.

Rain, Fire, Cutting/Clearing & Grazing Withholding Periods & Plant-back Period

A withholding period is the minimum interval that should elapse between the herbicide application and a disturbance (rain, fire, cutting, clearing or grazing) in the sprayed area. Plant back period is an agricultural term that has validity in other areas of land management, as some herbicides have a residual impact that can affect natural regeneration or the success of revegetation.

Herbicide	Rain	Fire, Cutting & Clearing	Grazing pasture	Plant back period – or when non-target plants may be affected
fluroxypyr	1 hr	7 days	7 days	Not significant
triclopyr, picloram & aminopyralid	1 hr	6 months	12 weeks	May be greater than 6 months
metsulfuron-methyl	4 hrs	7 days	Nil	Less than 6 months
glyphosate	6 hrs	7 days	Nil	Not significant
MCPA	6 hrs	7 days	7 days	Not significant
flupropanate	Light rain after spraying is beneficial	14 days or less if rain has washed the herbicide off the grass into the soil	4 months for boom spraying and 14 days for spot spraying. Stock are not to be grazed in treated areas for at least 14 days prior to slaughter. Do not use in a paddock that is part of dairy production (cows or goats).	Significant for sensitive grasses. May last for up to 2 years.

Spraying Near Water Catchment Reservoirs

ACTEW Water and the ACT Parks & Conservation Service have reached an agreement (table below) on the use of herbicides to control Blackberry and Woody Weeds in close proximity to

water catchments or potable (drinking) water intakes.

Herbicide Options for Blackberry and Woody Weed Control in Water Catchments

Area/Heading	glyphosate (safe aquatic form)	metsulfuron-methyl	triclopyr, picloram & aminopyralid	Comments
Drinking Water Guidelines Guideline Value	0.01 mg/L	n/a	n/a	
Drinking Water Guidelines Health Values	1 mg/L	0.03 mg/L	picloram (0.3 mg/L) triclopyr (0.01 mg/L) aminopyralid (not listed)	
Over potable water	Permitted	Not permitted	Not permitted	
Over non-potable water	Permitted	Permitted under off-label permit PER10857	Not permitted	The off-label permit does not allow a surfactant to be used over water.
Drainage areas prone to flooding	Not advisable as it is not selective. It kills mono-cots (eg. native grasses)	Permitted	Not permitted	
Upslope areas	Not advisable as it is not selective. It kills mono-cots (eg. native grasses)	Permitted but no closer than 5m to a waterway if a surfactant has been added. Does not kill mono-cots.	Permitted but no closer than 5m to a waterway. Does not kill mono-cots.	If a poor result has been achieved with metsulfuron-methyl then a herbicide containing triclopyr, picloram & aminopyralid should be used. Note it is not advisable to spray the area again with metsulfuron-methyl as this may create a metsulfuron-methyl resistant population of Blackberry.

Information for ACT Rangers & Field Officers

Contract Templates

The pre-qualified weed control contract templates are at: G:\23 PARKS RESERVES AND PUBLIC PLACES\VEGETATION MANAGEMENT\eWeeds\Templates 2013-14

No-Spray Register

There is a 'No-Spray' register that must be checked before commencing herbicide spraying operations. The register is at:G:\23 PARKS RESERVES AND PUBLIC PLACES\VEGETATION MANAGEMENT\eWeeds\No Spray Register

P-PPE

Professional personal protective equipment (P-PPE) should be used when using herbicides. Cut-dab work requires eye protection and water resistant gloves. High pressure herbicide spraying P-PPE includes: washable hat and overalls, water resistant gloves and boots, eye protection that prevents spray mists entering eyes, and a half mask respirator with filters designed for agricultural mists and sprays.

Environmental weed Control Priorities

Setting priorities makes the best use of limited resources to control invasive weeds. ACT weed management prioritisation is based on the NSW DPI Weed Risk Management System[3]. The weed risk assessments look at impact on the natural environment, primary industry and recreation areas.

How priorities are determined

The NSW DPI Weed Risk Management System evaluates the risk of not controlling a weed species along with its feasibility of control.

Weed Risk

Risk is based on: invasiveness, impacts and potential distribution. Weeds with lower risk ratings such as negligible and low are usually weeds of disturbed areas. Environmental weeds usually have risk ratings of either of medium, high or very high.

Feasibility of Coordinated Control

Feasibility of coordinated control takes into account control costs, persistence and current distribution. The higher the feasibility the stronger the management action as it is more likely to be successful. For instance a new incursion restricted to a few sites will have a higher feasibility of coordinated control and 'Eradication' would be the management action. On the other hand a widespread highly invasive weed would have a low feasibility of coordinated control so its management action would be 'protect priority sites' or asset-based protection.

Management Actions

The NSW DPI Weed Risk Management System shows how different risk assessment and feasibility scores lead to different management strategies. For a given feasibility of coordinated control, a higher weed risk leads to a stronger management action. This is because the aim is to reduce damage to the environment. For a given weed risk, if there is a lower feasibility of coordinated control then there is a lower level of management.

Project prioritisation

Each year, the ACT Weeds Working Group (ACT region land managers) and the ACT Weeds Advisory Group (technical experts) propose environmental weed control projects, as well as projects to protect rural leases (economic) and recreation areas (social). These projects are assessed for funding as part of a prioritised weed control program.

The prioritised program has been called the Environmental Weed Control Operations Plan or eWOP since 2009. The eWOP focus on protecting conservation reserves and other natural areas. But as required by the ACT Weeds Strategy, projects that reduce the economic and social impacts of weed invasion also have to be considered.

The following factors are considered when ranking weed control projects:

- Projects that control higher risk environmental weeds receive a higher ranking.
- The project is assessed against the relevant weed management action from the NSW Weed Risk Management System. For example:

[3] Johnson, S. (2009) NSW Weed Risk Management System, NSW Department of Primary Industry.

- If the management action is ‘protect priority sites’ then projects protecting high conservation value sites and buffer areas clearly meet this action.
- A management action to ‘contain spread’ or ’destroy infestations’ would include projects that protect high conservation value sites as well as projects in lower conservation areas that help to contain the spread of the target weed species.

- Projects are either new projects or follow-up control. Follow-up control is essential for successful weed management, so projects that involve follow-up weed control work receive higher ranking.

- Projects that protect economic (eg. joint weed control to protect a neighbouring grazing property) or social values (eg. controlling a weed species that interferes with access to a waterway), as well as environmental values receive a higher ranking.

- The ranking system also applies biodiversity triage. The gives a higher rank to projects that have a higher probability in protecting the most valued biodiversity assets.[4]

4 P.O Downey, M.C Williams, L.K Whiffen, B.A Auld, M.A Hamilton, A.L Burley, P.J Turner (2010b) Managing Alien Plants for Biodiversity Outcomes – the Need for Triage, Invasive Plant Science and Management 2010 3:1-11.

DETERMINING WEED MANAGEMENT ACTIONS

WEED RISK (Invasiveness, Impact, Potential Distribution)	FEASIBILITY OF COORDINATED CONTROL (Control costs, Persistence, Current Distribution)					
	Negligible (113+)	Low (56-113)	Medium (31-55)	High (14-30)	Very High (<14)	
Negligible (< 13)	Limited action	Limited action	Limited action	Limited action	Monitor	
Low (13-38)	Limited action	Limited action	Limited action	Monitor	Monitor Protect priority sites	
Medium (39-100)	Manage sites	Manage sites	Manage sites	Protect priority sites	Contain spread	ALERT
High (101-192)	Manage weed	Manage weed	Protect priority sites	Contain spread	Destroy infestations	
Very High (192+)	Manage weed	Manage weed Protect priority sites	Contain spread	Destroy infestations	Eradication	

Source: Johnson, S. (2009) NSW Weed Risk Management System, NSW Department of Primary Industry.

Explanatory Notes

Weed Risk Rating or Weed Danger Rating

A key question: Is a weed primarily a weed of disturbed areas (low threat) or has it the ability to invade un-disturbed native vegetation (high threat).

The NSW Weed Risk Management System measures invasiveness and also impacts, potential distribution & feasibility of control. The assessment looks at many aspects of weed risk to the environment, for example:

- Invasiveness: Can the weed invade dense vegetation or does it need moderate disturbance? Does it spread over long distances?
- Impacts: Does it dominate other plants? Does it prevent plant germination? Does it affect fire regimes? Is it poisonous? Does it alter soil nutrients? Does it prevent access?
- Potential distribution: What percentage of land use is suitable?

The table below lists the weed risks for a range of weeds. The higher risk ones are the most often controlled in the ACT. The risk ratings and feasibility of control guide whether a weed is considered for listing as a Pest Plant under the Pest Plants and Animals Act 2005 (ACT).

Feasibility of Control
Feasibility of coordinated control is based upon:

- The cost of control
- Persistence of the weed
- Current distribution

This also helps set priorities because it directs efforts to where the best return can be gained for control effort. It takes into account where a weed is on the Invasion Curve (above).
Controlling new infestations of high priority weeds (eradication and containment) receives a higher management priority than control of a high priority weed that is already widespread in an area (asset based protection).

Hierarchy of Management Actions

- 'Limited action': The weed or site can sometimes be managed as part of other higher priority work.
- 'Monitor': Use photo-points or mapping to tract over time. Take action if required.
- 'Manage sites': Incomplete methods of control, such as only slashing Thistles on fire trails.
- 'Manage weed': Control of the weed by herbicide, grazing, burning, slashing or revegetation.
- 'Monitor & Protect priority sites': Use photo-points or mapping to tract over time and if a threat to a high priority site emerges, undertake control work.
- 'Protect priority sites': Control weed at priority sites.
- 'Manage weed & Protect priority sites': Manage weed and control weed at priority sites.
- 'Contain spread': Controlling invasive weed in all priority sites and on surrounding land when it assists in containment of spread.
- 'Destroy infestations': Controlling all infestations of an invasive weed.
- 'Eradication': Control the invasive weed at all sites till seed bank is exhausted.

These actions can be grouped into two weed management aims – Reduce spread and Reduce impact:
Reduce spread: Eradication, Destroy infestations, Contain Spread
Reduce impact: Manage weed & Protect priority sites, Monitor & Protect priority sites, Protect priority sites, Manage weed, Manage sites, Monitor, Limited action

Priority Sites
Examples of priority sites:

- The eWOP ArcGIS maps show sites with rare or endangered plants, endangered ecological communities and other environmental assets.
- Water catchment areas, Wildflower 'hot spots', Wildlife Corridors, Uncommon vegetation types, Critical habitat for wildlife.

- Large reserves tend to have higher conservation values than small isolated reserves. The reason is that large reserves are more likely to contain healthy ecosystems. "A healthy ecosystem is seen as one that can maintain itself and adjust to natural pressures – this largely depends on diversity of species with mixed ages." [1]

Conservation Research and Planning can also advise on conservation values or biodiversity assets for a site.

ACT Weed Risk Ratings[2] and Management Actions for Natural Areas

Weed risk Category[3]	Common name	Species name	Assessment type[4]	Feasibility of coordinated control	Management action
Very High	African Lovegrass	*Eragrostis curvula*	Preliminary	Low	Protect priority sites
	Alligator Weed	*Alternanthera philoxeroides*	Preliminary	Very High	Eradication
	Bear-skin Fescue	*Festuca gautieri*	Completed	Very High	Eradication
	Black Willow	*Salix nigra*	Preliminary	High	Destroy infestations
	Blackberry	*Rubus fruticosus* species aggregate	Preliminary	Medium	Contain spread
	Chilean Needlegrass	*Nassella neesiana*	Preliminary	Low	Protect priority sites
	Coolatai Grass	*Hyparrhenia hirta*	Completed	Very High	Eradication
	Crack Willow	*Salix fragilis*	Preliminary	Very High	Destroy infestations
	Desert Ash	*Fraxinus angustifolia subsp. angustifolia*	Completed	High	Destroy infestations
	Gorse	*Ulex europaeus*	Preliminary	High	Destroy infestations
	Hairy Willowherb	*Epilobium hirsutum*	Completed	Very High	Eradication
	Madeira Vine	*Anredera cordifolia*	Completed	Very High	Eradication
	Mexican Feather Grass	*Nassella tenuissima*	Completed	Very High	Eradication
	Serrated Tussock	*Nassella trichotoma*	Preliminary	Medium	Contain spread
	Spanish Heath	*Erica lusitanica*	Completed	Very High	Eradication
High	African Boxthorn	*Lycium ferocissimum*	Preliminary	High	Contain spread
	African Olive	*Olea europaea subsp. cuspidata*	Completed	Very High	Destroy infestations
	Black Alder	*Alnus glutinosa*	Preliminary	Very High	Destroy infestations
	Broom	*Cytisus spp* and *Genista spp*	Preliminary	High	Contain spread
	Cootamundra Wattle	*Acacia baileyana#*	Preliminary	High	Contain spread
	European nettle Tree	*Celtis australis*	Preliminary	Very High	Destroy infestations
	European Olive	*Olea europaea subsp. europaea*	Completed	Very High	Destroy infestations
	False Caper	*Euphorbia terracina*	Completed	High	Contain spread

[1] Costermans L. (2011) Trees of Victoria and Adjoining Areas, 6th edition, Costermans Publishing

[2] The table is based on the NSW Weed Risk Management System – see table 2. Some of these ratings will differ outside of the ACT due to different soil types and climate.

[3] Using the NSW DPI Weed Risk Management System and ACT data.

[4] Completed risk assessments were undertaken by Butler & Associates with input from the Weeds Advisory Group. The preliminary assessments were undertaken by Parks and Conservation.

Weed risk Category[3]	Common name	Species name	Assessment type[4]	Feasibility of coordinated control	Management action
	Firethorn	*Pyracantha spp.*	Preliminary	High	Contain spread
	Gazania	*Gazania linearis*	Completed	Very High	Destroy infestations
	Hawthorn	*Crataegus monogyna*	Preliminary	High	Contain spread
	Madagascan Fireweed	*Senecio madgascariensis*	Completed	Very High	Destroy infestations
	Orange Hawkweed	*Hieracium aurantiacum*	Completed	Very High	Destroy infestations
	Ox-eye Daisy	*Leucanthemum vulgare*	Preliminary	High	Contain spread
	Prickly Pear	*Opuntia stricta*	Completed	Very High	Eradication
	Sagittaria	*Sagittaria platyphlyla*	Completed	High	Contain spread
	St John's Wort	*Hypericum perforatum*	Preliminary	Medium	Protect priority sites
	Sweet Briar	*Rosa rubiginosa*	Preliminary	Medium	Protect priority sites
	Tree of Heaven	*Ailanthus altissima*	Preliminary	High	Contain spread
	Tutsan	*Hypericum androsaemum*	Completed	Very High	Destroy infestations
	Yellow Bamboo	*Phyllostachys aurea*	Preliminary	Very High	Destroy infestations
Medium	Bathurst Burr	*Xanthium spinosum,*	Preliminary	High	Protect priority sites
	Chinese Pistachio	*Pistacia chinensis*	Preliminary	High	Protect priority sites
	Cotoneaster	*Cotoneaster glaucophyllus*	Preliminary	High	Protect priority sites
	Himalayan Honeysuckle	*Leycesteria formosa*	Completed	Very High	Contain spread
	Nodding Thistle	*Carduus nutans subsp. nutans*	Preliminary	High	Protect priority sites
	Oregon Grape	*Berberis aquifolium*	Completed	High	Protect priority sites
	Paterson's Curse	*Echium plantagineum*	Preliminary	Medium	Manage sites
	Periwinkle	*Vinca major*	Preliminary	High	Protect priority sites
	Photinia	*Photinia sp. & cultivars*	Completed	Very High	Contain spread
	Saffron Thistle	*Carthamus lanatus*	Preliminary	Medium	Manage sites
	Sulphur Cinquefoil	*Potentilla recta*	Preliminary	Very High	Protect priority sites
	Verbascum	*Verbascum thapsus*	Preliminary	High	Protect priority sites
	WA Bluebell Creeper	*Billaderia heterophylla#*	Preliminary	High	Protect priority sites
Low	Scotch Thistle	*Onopordum acanthium*	Preliminary	Very High	Monitor & protect priority sites
	Butterfly Bush	*Oenothera lindheimeri*	Completed	Very High	Monitor & protect priority sites
	Strawberry Tree	*Arbutus unedo*	Completed	Very High	Monitor & protect priority sites
	Fleabane	*Conyza bonariensis*	Preliminary	Low	Limited action
	Horehound	*Marrubium vulgare*	Preliminary	Very high	Monitor & protect priority sites

Weed risk Category[3]	Common name	Species name	Assessment type[4]	Feasibility of coordinated control	Management action
	Capeweed	*Arctotheca calendula*	Preliminary	Low	Limited action
	Hemlock	*Conium maculatum*	Preliminary	Low	Limited action
Negligible	Feathertop Rhodes Grass	*Chloris virgata*	Preliminary	Negligible	Limited action
	Fat Hen	*Chenopodium album*	Preliminary	Negligible	Limited action
	Flatweed	*Hypochaeris glabra*	Preliminary	Negligible	Limited action
	Common Evening Primrose	*Oenothera strica subsp. stricta*	Preliminary	Negligible	Limited action
	Twiggy Mullien	*Verbascum virgatum*	Preliminary	Negligible	Limited action

Examples of native plants that have become invasive when planted outside their natural range.

Environmental Weed and Other Pest Plant Prescription Sheets

These guidelines list control methods for environmental weeds and other pest plants. Some pest plants that are only weeds of disturbed sites are included as their control is sometimes required as part of maintaining recreation sites and other amenity areas.

Remember that preventing new infestations of environmental weeds is of paramount importance. Ways to prevent new infestations: avoid excessive ground cover or soil disturbance, use clean vehicles and equipment, avoid overgrazing, and restore areas that have lost plant cover.

Refer to WEEDeck cards www.sainty.com.au for photos of the weed species. The Weeds Australia web site www.weeds.org.au is a good starting point for photos and information about environmental weed management.

The chemical controls listed are from registered herbicide labels and off-label permits approved by the Australasian Pesticides and Veterinary Medicines Authority (APVMA).

Refer to the list below for examples of herbicide products containing the chemicals listed in the prescriptions for each weed species. There are now numerous generic herbicide brands on the market so it is important that you are aware of the concentrations of the chemicals in these herbicides.

Chemical names & examples of products

Chemical name	Example of herbicide product or trade name
bromoxynil 200g/L	Bromoxynil
bromoxynil 200g/L & MCPA 200g/L	Brominil M
clopyralid 300g/L	Lontrel, Clopyralid 300
dicamba 500g/L	Dicamba 500
dichlobenil 67.5g/kg	Casoron G
diuron 500g/L	Diuron
emulsifiable vegetable oil	Synertrol Oil
fluazifop-P	Fusilade Forte
flupropanate 745g/L	Kenock,Taskforce
flupropanate 86.9g/kg	GP Flupropanate
fluroxypyr 200g/L	Starane 200, Fluroxypyr 200
fluroxypyr 333g/L	Starane Advanced
glufosinate-ammonium 200g/L	Basta
glyphosate 360g/L	Nufarm Glyphosate 360, Glyphosate 360
glyphosate 360g/L (safe aquatic form)	Round-up Biactive, Glyphosate Green 360
glyphosate 360g/L & metsulfuron-methyl 600g/kg	Trounce
hexazinone 250g/L	Velpar
MCPA 340g/L & dicamba 80g/L	Kamba M
MCPA 500g/L	MCPA 500
MCPA 750g/L	Agritone 750, MCPA 750
MCPA 80g/L, MCPP 336g/L & dicamba 40g/L	Sportsground
metsulfuron-methyl 600g/kg	Brush-Off, Generex Metsulfuron
metsulfuron-methyl 600g/kg & glyphosate 360g/L	Cut-Out
picloram 43g/kg	Vigilant
simazine 900g/kg	Simazine 900
sulfometuron-methyl 20g/kg	Enviromac G
sulfometuron-methyl 750g/kg	Oust
terbutryn 500g/L	Igran
triclopyr 300g/L & picloram 100g/L	Grazon DS, Picloram and Triclopyr 400

Chemical name	Example of herbicide product or trade name
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	Grazon Extra
triclopyr 600g/L	Garlon 600, Generex Triclopyr

A bio-degradable spray dye (usually pink or red) should be used when spot spraying. These dyes are not used when boom spraying or aerial spraying. Larger booms have in-built foam markers to help line up the boom spray passes.

Most herbicides are more effective when a wetting agent or non-ionic surfactant is used. The prescriptions mention when a surfactant is required and some product examples are listed. There are now large ranges of surfactants, and some are formulated for specific herbicides. For example Hot-Up for use with glyphosate, and Uptake Oil for use with fluroxypyr.

Some surfactants are oil based (petroleum or vegetable) which can significantly reduce spray drift, eg. Synertrol Oil. Some have penetrators that are useful for plants with hard glossy or waxy leaf surfaces, eg. Pulse Penetrant or Input. Others alter water pH, eg. LI700.

Permits (Off-Label)

The herbicide prescriptions are based on label recommendations or off-label permits. The following permits have been issued by the Australian Pesticides & Veterinary Medicines Authority (APVMA) to the ACT Parks & Conservation Service & TAMS. The conditions of each permit can be viewed at www.apvma.gov.au

PER10857 – Control Alligator Weed, Red Ludwigia, Blackberry, Giant Willowherb & Willow regrowth with metsulfuron-methyl (Expires 31 October 2013)
PER13420– Control of Woody Environmental Weeds using glyphosate, triclopyr, metsulfuron-methyl & picloram - includes cut-stump, stem injection, basal bark treatment, foliage spray (Expires 31 March 2017)
PER11872 – Control of Japanese Honeysuckle on public land in the ACT (Expires 31 December 2013).
PER9792 – Control of Tussock Grasses NSW & ACT (Expires 30 November 2015)
PER11838 – Triclopyr 600g/L and glyphosate 360g/L - Public Land in the ACT/Periwinkle and English Ivy (Expires 31 March 2015)
PER12553 – Triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L for control of Verbascum and Nodding Thistle and metsulfuron-methyl 600g/kg for Control of Verbascum (Expires 31 January 2016).

African Lovegrass *(Eragrostis curvula)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Densely tufted, erect perennial tussock grass species, 30-120cm tall (short and tall form).

DISTRIBUTION
Establishes readily along rivers, roadsides, parkland areas and disturbed sites. From these locations it rapidly spreads into neighbouring land including un-disturbed areas.

REPRODUCTION
Contaminant of soils and gravels used in road making. Also dispersed by wind, animal coats, machinery, water and clothing.

CONTROL
Cultural control: Maintain a strong, dense, competitive cover of desired vegetation. Minimise disturbance. Do not mow or slash when in seed. Thoroughly clean all mowers and slashers that have operated in African Lovegrass areas before moving to un-infested areas.

Biological control: No biological control agents have been investigated to date.

Chemical control: The fluproponate 745g/L rates below are from Australian Pesticides & Veterinary Medicines Authority (APVMA) www.apvma.gov.au off-label permit no: PER9792.

Chemical	Spot spray rate per 100L water	Boom spray rate per ha	Comments
glyphosate 360g/L	1L		Apply when plants are actively growing.
fluproponate 745g/L	150mL to 300mL	1.5L to 3L per hectare with 150L water per hectare	Off-label permit rates. Do not boom spray in native grasslands or native pasture.
fluproponate 745g/L & glyphosate 360g/L	150mL to 300mL fluproponate and 335mL glyphosate	1.5L to 3L fluproponate per hectare plus 380 to 630mL/ha of glyphosate plus 150L water per ha	Apply when plants are actively growing. Combined herbicides to ensure seed set suppression.

Alligator Weed *(Alternanthera philoxeroides)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Rapid, summer growing stoloniferous perennial primarily of wet or moist areas.

DISTRIBUTION
In Canberra, plants have been cultivated by some communities and have infested backyards. From there they have spread via stormwater drains into Lake Ginninderra and Yerrabi pond.

REPRODUCTION
Small pieces of stem. While seed is produced, it does not appear to germinate in ACT conditions.

CONTROL
Cultural control: Mechanical control of terrestrial infestations e.g. ploughing will only increase the infestation.

Biological control: A flea beetle was introduced in 1976 and controls floating infestations but not land infestations.

Chemical control: Control using registered herbicides or under off-label permit from Australian Pesticides & Veterinary Medicines Authority (APVMA). Refer to permit no. PER10857 at www.apvma.gov.au for use of metsulfuron-methyl 600g/kg.

Chemical	Spot spray rate	Comments
metsulfuron-methyl 600g/kg	10g per 100L water	Apply directed spray using low drift nozzle. Cannot be used on potable water.
glyphosate 360g/L (safe aquatic form)	1L per 100L water	In potable water for the floating form of the plant only. Do not apply within 0.5 km up-stream of potable water intake.
dichlobenil 67.5g/kg	170 – 230 kg per ha or 1.7 – 2.3 kg per 100 m2	For water less than one metre deep. Apply to standing water and toward the end of the dormant period of the plant. Preferably July – August.
	230 – 340 kg per hectare treated area or 2.3 – 3.4 kg per 100 m2	For water greater than one metre deep. Apply to standing water and toward the end of the dormant period of the plant. Preferably July – August.

Bathurst Burr *(Xanthium spinosum)* & Noogoora Burr *(Xanthium occidentale)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Annual herb to compact bushy plant, spiny and erect up to 1m tall.

DISTRIBUTION
Over much of Australia, often abundant. Common on tablelands, slopes and western plains. Appear in spring and summer after rain.

REPRODUCTION
Adherence of burrs to animals and clothing. Attachment is quick and persistent. Seeds can remain viable for very long periods of time.

CONTROL
Cultural control: Maintain a strong, dense, competitive cover of desired vegetation. Recently disturbed sites eg. post holes and rip lines in previously infested areas should be checked for the appearance of seedlings. Plants can be slashed but it must be well before burrs are formed. Hand chipping, removal and destruction is necessary if plants are near maturity. Caution: burrs may mature on cut bushes or burrs may form on cut stems.

Biological control: Is very difficult to achieve because burrs are formed so quickly. The Bathurst Burr Seed Fly (*Euaresta bullans*) is an accidental bio control that can sometimes have an impact.

Chemical control: Apply early so that burrs will not form. Use selective herbicides where possible to minimise the occurrence of bare soil areas. The following herbicides and rates are registered for use in the ACT. Use the higher rate on larger or older plants.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 750g/L	660mL to 1.35L	130 to 270mL	No	
fluroxypyr 333g/L	450mL in at least 50L of water	45mL	Uptake Oil at 500mL/100L water	Seedlings and young plants
glyphosate 360g/L	Not advised	1L	No	Non-selective. Use for spot treatment only.

Blackberry *(Rubus fruticosus)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Prickly, trailing perennial shrub up to 5m high with scrambling stems to 6m long.

DISTRIBUTION
Throughout southern Australia, particularly along water courses in cool, high rainfall areas.

REPRODUCTION
Reproduction can be by seed, root parts, cuttings and root formation when tips contact soil (layering). Seeds spread by birds, foxes and water.

CONTROL
Cultural control: Maintain a dense, healthy cover of desired vegetation. Remove the crown and roots through a program of deep cultivation. Burn or slash to reduce rate of spread.

Biological control: European rust (*Phragmidium violaceum*) has been released by the CSIRO as a biological control. In 2007 the ACT Parks & Conservation Service & TAMS staff and other land mangers released the rust fungus on behalf of the CSIRO.

Chemical control: During any Blackberry spraying operation signposting must be used to warn that spraying is taking place. Signs warning the public should be placed around the area being treated prior to commencing spraying operations.

Chemical	Spot spray rate per 100L water	Surfactant	Comments
triclopyr 600g/L	170mL	Uptake Spray Oil at 500mL/100L or equivalent product	Thorough coverage of the bush is essential. Grasses unaffected Refer to product label for low volume and controlled droplet application techniques.
triclopyr 300g/L & picloram 100g/L	500mL	Uptake Spray Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Do not spray in high volumes under trees and do not spray in areas prone to flooding. Does not kill grasses.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	350mL to 500mL	Uptake Spray Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Do not spray in high volumes under trees and do not spray in areas prone to flooding. Does not kill grasses. Use the lower rate in more sensitive areas to minimise off-target damage.
glyphosate 360g/L	1.0 - 1.3L	No	Non-Selective – will kill grasses and other ‘mono-cots’. Use for spot treatment only.

Chemical	Spot spray rate per 100L water	Surfactant	Comments
metsulfuron-methyl 600g/kg	10 grams	Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Grasses and other 'mono-cots' unaffected. If using the off-label permit to spray over non-potable water, do not use a surfactant.
metsulfuron-methyl 600g/kg & glyphosate 360g/L	10 grams metsulfuron-methyl and 200mL glyphosate	Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Non-Selective. Do not apply to bushes with mature fruit. If used as part of the off-label permit to spray metsulfuron-methyl over non-potable only add glyphosate (safe aquatic form). Do not use an additional surfactant.

Black Alder *(Alnus glutinosa)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Deciduous tree to 18m tall. Often forms short thickets.

DISTRIBUTION
Eastern highlands and Australian Alps - in damp areas. In the ACT it is an invasive weed around Lake Burley Griffin and the Molonglo River.

REPRODUCTION & DISPERSAL
Seed spread by water and birds.

CONTROL
Cultural Control.: Seedlings can be pulled out or chipped out.

Biological Control. None

Chemical control:

Chemical	Cut Stump Treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L (safe aquatic form)	1:1 – 1:5 glyphosate : water		Cut tree or sapling close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
metsulfuron-methyl 600g/kg		10g	For plants up to 1 metre high only. Add non-ionic surfactant at label rate.

Black or Spear Thistle *(Cirsium vulgare)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect biennial herb to 1.5m with a long, well developed taproot.

DISTRIBUTION
Occurs as a weed in all Australian states in pasture, cereal crops and waste areas.

REPRODUCTION
Seeds are transported by wind, animals and vehicles or as a contaminant in hay. Seeds germinate in autumn after rain.

CONTROL
Cultural Control. Isolated plants can be hand hoed but much of the root system needs to be removed. Slashing can be carried out but timing is critical - if too early the plant reshoots, if too late the seeds develop on cut stems. As the flowers are opening appears to be the best time.

Biological Control. A gall-fly has been investigated.

Chemical Control. Use selective herbicides where possible to minimise the occurrence of bare soil areas and maintain competition from other species. Treat actively growing plants in young stages of growth. The following herbicides and rates are registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 750g/L	1.35L	270mL	No.	Apply at rosette stage. Will kill other forbs/herbs. Also applicable to Variegated Thistle.
MCPA 500g/L	1.5L to 2.0L	-	No	Apply at early rosette stage.
bromoxynil 200g/L & MCPA 200g/L	60mL per 100 sqm	300mL	No	Broadleaf weed control in established turf. Apply evenly over the area to be treated. Do not mow turf for 2 days after treatment.
MCPA 340g/L & dicamba 80g/L	2.8L to 4L	190mL to 276mL		Higher rate on larger rosettes

(African) Boxthorn *(Lycium ferocissimum)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	

HABIT
Straggling shrub to 3m high with drooping, widely spreading branches, terminating in spines.

DISTRIBUTION
Naturalised in areas of low management throughout most of temperate Australia including roadsides, reserves and waterways.

REPRODUCTION
Reproduction from seed, which may have a long dormancy period. Spread by contamination of agricultural seed or by machinery.

CONTROL
Cultural control: Physical removal and burning is most effective as plants killed with herbicides still occupy space and can provide vermin harbour for several years. Exotic pasture can be cultivated to remove seedlings and regrowth which can appear for several years.

Biological Control: No biological control agents have been investigated to date.

Chemical Control: Treat actively growing plants from full leaf to onset of leaf fall. Bushes should be cut off at ground level and the stumps treated to prevent regrowth.

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
glyphosate 360g/L		1:1 – 1:5 water	Foliage spray: non-selective. Use for spot treatment only. Cut stump: treat stump immediately after cutting. Use the more concentrated rates of glyphosate when plant growth is slowing down.
triclopyr 600g/L	170mL	2:60 with diesel	Basal bark spray: For treatment of suckers and seedling up to 5cm basal diameter. Spray or paint bark around the stem to 30cm, wetting thoroughly. Cut stump: Apply to freshly cut stumps of shrubs greater than 5cm in basal diameter. Best results are obtained when stems are cut less than 15cm above the ground. Treat stump immediately after cutting.

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	500mL		Do not use under desirable trees. Add Uptake Oil at 500mL/100L or equivalent product to reduce spray drift.

Broad-kernel Espartillo or Chilean Ricegrass *(Amelichloa caudatum)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Perennial tussock grass 55-100cm tall. The awn on the seed are 12 to 18mm long and twisted.

DISTRIBUTION
Broad Kernel Espartillo occurs in the North-Western, Central-Western and South-Western Slopes and South-Western Plains in New South Wales, and in the Midlands in Victoria.

REPRODUCTION
Broad Kernel Espartillo is solely seed dispersed. The seeds can be dispersed by stock, wildlife and humans as the awns of the seeds readily attaching to wool, fur and clothing.

CONTROL
Cultural control: Winter cropping and repeated cultivation are effective in controlling Broad Kernel Espartillo, but when this species invades pastures, control is more difficult. Light stock grazing and rotational or strip grazing should maintain pasture competitiveness, and slow the invasion of the weed. Do not mow or slash when in seed. Thoroughly clean all mowers and slashers that have operated in Broad-kernel Espartillo areas before moving to un-infested areas.

Biological control: No biological control agents have been investigated to date.

Chemical Control:

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
glyphosate 360g/L	6L plus 75L to 200L water	1L	Hot-Up at 250mL/100L o allow spraying during dry periods.	Non-Selective. Careful spot-spraying with a lance to reduce spray drift is very effective. Follow-up essential.
fluproponate 745g/L	3L plus 150L water or if aerial spraying add 80L water	300mL	For aerial spraying add compatible anti-drift additive.	Do not boom spray in native grassland or native pasture. Check resistance of desirable pasture grasses before boom spraying.

Broom species *(Cytisus & Genista spp.)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Erect perennial shrub up to 3m high.

DISTRIBUTION
A garden escape which has become a major problem in Barrington Tops and valleys within the Alps of NSW and Victoria which have the same soils and climate as much of the ACT.

REPRODUCTION
Broom is spread solely by seeds which are released from a pea-like pod in summer. The seeds can be spread by vehicles, machinery, people, animals etc. Viable seeds are not usually produced until the plants are about 3 years old.

CONTROL
Cultural control: Single bushes can be grubbed out. Fire causes mass germination. So fire followed by herbicide spraying can be effective in reducing the seed bank.

Biological control: The Cape Broom Psyllid is effective on Cape Broom/Montpellier Broom (*Genista monspessulana*). The Scotch Broom/English Broom Gall Mite can be effective on Scotch Broom (*Cytisus scoparius*).

Chemical control: It is essential to treat actively growing plants in the full leaf stage. Plants with a high percentage of woody stem material to leaf area will be difficult to kill.

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
triclopyr 600g/L	170mL	-	Apply spring to mid summer prior to pod formation.
glyphosate 360g/L	-	1:1 - 1:5 glyphosate : water	Cut shrub close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
triclopyr 300g/L & picloram 100g/L	250 mL (spring to mid-summer prior to pod formation) or 350 mL (autumn to early winter)		Do not use large volumes under trees and do not use in areas prone to flooding. Add Uptake Oil at 500mL/100L or equivalent product.

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	250 mL (spring to mid-summer prior to pod formation) or 350 mL (autumn to early winter)		Do not use large volumes under trees and do not use in areas prone to flooding. Add Uptake Oil at 500mL/100L or equivalent product.

Cabomba *(Cabomba caroliniana)*[1]

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Cabomba is a perennial aquatic herb with branched stems that have white or reddish brown hairs growing on them. It is fully submerged, except for occasional leaves and flowers that float and later emerge on stalks several centimetres above the water surface. It has finely divided fan shaped leaves.

DISTRIBUTION
Cabomba is naturalised in widely scattered locations in northern and eastern Australia. Most infestations occur in the hinterlands of northern New South Wales and southern Queensland. However, infestations have been recorded as far apart as Darwin and central Victoria.

REPRODUCTION
Cabomba does not appear to produce mature, fertile fruit or seed in Australia. It reproduces and spreads here by the movement of small plant pieces that readily break off the brittle stems and runners. Fragments may survive in water for 6-8 weeks, and a detached shoot as short as 10 mm with at least one pair of leaves can grow into a mature plant. Fragments can be spread by water flow and possibly by attachment to waterfowl, water craft, and boat trailers, also by disposal of unwanted aquarium plants, as well as being deliberately planted to allow wild cultivation for the aquarium trade. It is still illegally sold as an aquarium plant in many States of Australia, supplied by both growers and wild harvest operations.

CONTROL
Cultural control: Physical cutting and removal is suited to accessible areas of closed water bodies with established heavy infestations. However, Cabomba grows so quickly that treatment is only likely to maintain a clear water surface for a few weeks and the cost is high. Lowering of the water level (drawdown) may be the best option for drinking water supplies.

Biological control: Under investigation.

Chemical control: Consult the NSW Department of Primary Industry.

[1] Information from www.weeds.gov.au (Australian Government – Weeds in Australia)

Caper Spurges *(Euphorbia lathyris)* & other Tall Spurges

WONS		Declared Pest Plant		Environmental weed		Weed of cultivation		Weed of other disturbed sites	X

HABIT
Stout or robust tall semi-woody herbs – annual or biennial.

DISTRIBUTION
Naturalised in Woodlands & Grasslands areas of SE Australia – where they have spread from adjacent home gardens.

REPRODUCTION
Reproduction from seed or dumped plant material.

CONTROL
Cultural control: Young plants can be chipped out – but minimise soil disturbance as this favours Caper Spurge and other broadleaf herbaceous weeds. Maintain a strong, dense perennial grass cover – which will include grazing control (rabbits, kangaroos and livestock).

Biological Control: No biological control agents have been investigated to date.

Chemical Control:

Chemical	Spot spray rate per 100L water	Surfactant	Comments
metsulfuron-methyl 600g/kg	10g	Add a non-ionic surfactant at the label rate.	

Capeweed *(Arctotheca calendula)*

WONS		Declared Pest Plant		Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Small rosette forming annual daisy.

DISTRIBUTION
Naturalised across SE Australia.

REPRODUCTION
Reproduction from seed.

CONTROL
Cultural control: Young plants can be chipped out – but minimise soil disturbance as this favours Capeweed and other broadleaf herbaceous weeds. Maintain a strong, dense perennial grass cover – which will include grazing control (rabbits, kangaroos and livestock). A good litter layer also prevents its spread.

Biological Control: Red-legged Earth Mite and another mite species have limited impact.

Chemical Control: See below.

Chemical	Spot spray rate per 100L water	Boom spray rate	Surfactant	Comments
MCPA 750g/L	130mL to 270mL	1.45L/ha		Boom at seedling stage only. The Boom and Spot spray rates are also registered for Nettle. The Spot spray rate is registered for a wide range of broadleaf weeds.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	150mL		Uptake Oil at 500mL/100L or equivalent product	Spray when in flower

Caltrop or Cat head or Puncture Thorn *(Tribulis terrestris)*

WONS		Declared Pest Plant		Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Branching prostrate herb – annual or perennial

DISTRIBUTION
Naturalised in Woodlands & Grasslands areas of SE Australia. More often a problem in urban areas where it causes punctures in bike and wheelchair tyres – due to spines on the small star-shaped fruit. May be a cosmopolitan native species.

REPRODUCTION
Reproduction from seed. Mowers, vehicles and animals are the main forms of spread in Canberra.

CONTROL
Cultural control: Young plants can be chipped out – but minimise soil disturbance as this favours broadleaf herbaceous weeds. Maintain a strong, dense perennial grass cover – which will include grazing control (rabbits, kangaroos and livestock).

Biological Control: No biological control agents have been investigated to date.

Chemical Control: See below.

Chemical	Spot spray rate per 100L water water	Surfactant	Comments
fluroxypyr 333g/L	300mL	Uptake Oil at 500mL/100L or equivalent product	

Chilean Needle Grass *(Nassella neesiana)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect, tufted perennial tussock forming grass.

DISTRIBUTION
Widespread along the Great Dividing Range and its western slopes from Queensland border through to Victoria. It is also found in Sydney, Melbourne and to west in the Adelaide Hills.

REPRODUCTION
Chilean Needle Grass produces two types of seed, normal flower head seed and a special type of "seed" at the base of the plant. Spread by machinery, infested soils, gravels, stock feed, animal coats, clothing, wind and water.

CONTROL
Cultural control: Maintain a strong, dense, competitive cover of desired vegetation. Vehicle hygiene is essential to stop the spread of Chilean Needle Grass. Do not mow or slash when in seed. Thoroughly clean all mowers and slashers that have operated in Chilean Needlegrass areas before moving to un-infested areas.

Chemical control. Apply from Winter to Spring when the grass is highly identifiable.

Chemical	Spot spray rate per 100L water	Boom Spray	Comments
glyphosate 360g/L	1L	4-6L/ha in 75 to 200L water per ha	Good results are achieved in winter, spring and autumn.
fluproponate 745g/L	150mL to 300ml	1.5L to 3L/ha in 150L water per ha	Do not boom spray in native grassland or native pasture.

Cootamundra Wattle *(Acacia baileyana)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Tall Shrub to small tree..

DISTRIBUTION
A native plant of limited natural distribution but has become an Environmental weed around urban areas, where it was planted extensively.

REPRODUCTION
Seed.

CONTROL
Cultural control: Small plants can be grubbed out. Cut flush with the ground level to avoid needing herbicide.

Biological control: Not applicable.

Chemical control:

Chemical	Spot spray rate	Surfactant	Cut-stump	Comments
triclopyr 600g/L	160 to 320mL per 100L water	Uptake Oil at 500mL/100L or equivalent product		
triclopyr 600g/L	Basal bark spray at 1 litre of triclopyr per 60 litres of diesel			For plants up to 5cm basal stem diameter spray or paint the herbicide onto the bark to a height of 30cm.
triclopyr 600g/L			1 litre per 60 litres of diesel	
glyphosate 360g/L			1 to 1 up to 1 to5 parts water	

Cotoneaster *(Cotoneaster spp.)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Evergreen shrub or tree to 4m x 2-3m.

DISTRIBUTION
Garden escape. Common in tablelands and coast of NSW and Victoria. Grows on all soils except sands. Common on waste land and roadsides.

REPRODUCTION
Berries readily eaten by birds and animals then dispersed in droppings.

CONTROL
Cultural control: Large bushes can be pulled out with a tractor and chain. Smaller plants can be cut back and the stumps dug out. Follow up hand-pulling of seedlings is essential. Replant with indigenous species. Promote alternative species for sale by garden centres.

Biological control: No biological control agents have been investigated to date. In rural areas stock graze the plants and exert effective control.

Chemical control: Treat the cut stump of actively growing plants with the herbicide glyphosate before berry formation. Avoid the use of glyphosate during winter as chemical uptake will be very slow and possibly ineffective. Plants up to 1 metre (no higher) can be sprayed with metsulfuron-methyl 600g/kg.

Chemical	Cut Stump Treatment	Spot spray	Comments
glyphosate 360g/L	1:1 – 1:5 glyphosate : water		Cut shrub close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
metsulfuron-methyl 600g/kg		10g/100L water	For plants up to 1 metre high only. Add non-ionic surfactant.

English Ivy *(Hedera helix)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
A vigorous ground cover and climber that forms mono-cultures. Smothers and kills trees. Older stems become woody.

DISTRIBUTION
Has invaded forest and riparian areas in South Australia, NSW, ACT and Victoria.

REPRODUCTION & DISPERSAL
Seed spread by birds and also stem fragments. Often dumped by home gardeners in remnant bushland where it can establish new infestations.

CONTROL
Cultural Control: Small infestations can be manually removed.

Biological Control. None

Chemical control:

Chemical	Cut-Stump treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L and triclopyr 600g/L		1L glyphosate and 1L triclopyr	Add 200mL/100L of Pulse Penetrant (organosilicone surfactant) or equivalent. Do not spray Ivy on the trunks of desirable trees – as this will kill the tree. Either cut or pull the Ivy off the tree before spraying.
glyphosate 360g/L	1:1 – 1:5 glyphosate : water		Ivy is a woody environmental weed so it is covered by off-label permit Per13420.

Fireweed or Madagascan Fireweed *(Senecio madagascariensis)*

WONS	X	Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
An annual or a short-lived perennial that can vary greatly in size and shape and will grow up to 50 cm.

DISTRIBUTION
Mainly coastal areas of New South Wales and southern Queensland. Plants have been located in the ACT (eg. growing as a weed in tubestock and near roadsides). Still in the 'Eradication' phase of the Invasion Curve in the ACT (see the graph at the front of these guidelines).

REPRODUCTION
Mainly by wind-borne seed.

CONTROL
Cultural Control:
Hand collected or chipped plants must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: An orange rust (*Puccinia lagenophorae*) can affect Fireweed. The blue stem borer moth (*Patagoniodes farinari*) has a minor impact (www.weeds.gov.au).

Chemical Control:

Chemical	Boom spray rate	Spot spray rate per 100L water	Comments
bromoxynil 200g/L	1.4 to 2.8L/ha in 150 to 200L water/ha	200ml	Do not use if temperate is greater than 20 degrees Celsius. Use higher rate on infestations that are dense or in flower.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	Not applicable	350ml	Add Uptake Oil at 500mL/100L or equivalent product.

Gorse *(Ulex europaeus)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect perennial shrub up to 3m high.

DISTRIBUTION
A garden escape which has become a major problem in Victoria and Tasmania. Also a problem in South Australia and SW Western Australia.

REPRODUCTION
Gorse is spread solely by seeds which are released from a pea-like pod in summer. The seeds can be spread by vehicles, machinery , people, animals etc.

CONTROL
Cultural control: Single bushes can be grubbed out and burnt
before seeding. Dense patches have been eliminated by bulldozing and repeated cultivations. Maintain a strong, dense vegetation cover.

Biological control: Gorse Seed Weevil Exapion ulicis, Gorse spider mite Tetranychus lintearius and Gorse Thrips Sericothrips staphylinus, have had limited control success. Another thrip of Portuguese origin is being reared for field release. A further two agents, a pod moth and soft shoot moth, are also under investigation for potential release into Australia (source: www.weeds.gov.au).

Chemical control:

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
triclopyr 600g/L	170mL or 340mL	-	Apply spring to mid summer prior to pod formation. Higher rate on larger hardened plants. Add non-ionic surfactant at 125mL/100L.
glyphosate 360g/L	-	1:1 - 1:5 glyphosate : water	Cut shrub close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	250mL for 1 to 1.5m high shrubs 350mL for over 1.5m tall or Autumn control		Do not use in high volumes under trees and do not use in areas prone to flooding. Add Uptake Oil at 500mL/100L or equivalent product.

Codlins and Cream or Hairy Willowherb *(Epilobium hirsutum)*

WONS		Declared Pest Plant		Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Semi-aquatic semi-woody herb to 2m high

DISTRIBUTION
A garden escapee with the potential to invade large areas of Southern Australia.

REPRODUCTION
Spread by seeds & rhizomes. Fluffy hairs on seed aid wind dispersal.

CONTROL
Cultural control: Single plants can be dug out – but ensure all rhizome is removed. Do not dispose of plants in wet areas.

Biological control: None available.

Chemical control:

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
metsulfuron-methyl 600g/kg	10g	Not applicable	No surfactant can be added if spraying over water. An alternative is to add a spike of glyphosate 360g/L (safe aquatic form) at 200mL/100L. But this will damage grasses and sedges.

Hawthorn *(Crataegus monogyna)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Erect, perennial, deciduous shrub or small tree to 6m. Intricately branched, each branch armed with stout spines.

DISTRIBUTION
Introduced as a garden ornamental or hedge plant. Naturalised and widespread in S.E. Australia and infests open grassland and woodlands especially in colder areas.

REPRODUCTION
Reproduction is by seed. The berries are readily eaten by birds and animals who are the most important means of dispersal. Provides habitat for Light Brown Apple Moth and Pear and Cherry Slug.

CONTROL
Cultural control: Plants can be removed mechanically but regrowth occurs unless all the crown and top few centimetres of the root system is removed. Smaller plants can be cut back and the stumps dug out. Follow up hand pulling of seedlings is essential. Replant with indigenous species. Promote alternative species for sale by garden centres.

Biological control. No biological control agents have been investigated to date.

Chemical control. Apply herbicides when bushes are actively growing and before berry formation. Avoid the use of herbicides during winter as chemical uptake will be very slow and possibly ineffective.

Chemical	Spot spray rate per 100L water water	Cut Stump Treatment	Comments
metsulfuron-methyl 600g/kg	10 grams		Spray to thoroughly wet foliage, but not to cause run-off. Add a non-ionic surfactant at the label rate.
glyphosate 360g/L		1:1 – 1:5 glyphosate : water	Cut shrub close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.

Chemical	Spot spray rate per 100L water water	Cut Stump Treatment	Comments
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	500mL		Add one of the following surfactants: Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product

Horehound *(Marrubium vulgare)*

WONS		Declared Pest Plant		Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect, spreading perennial herb, up to 80cm tall with a short taproot.

DISTRIBUTION
Widespread weed of pasture and wasteland throughout Australia. It is usually unpalatable to stock, but can taint meat and milk of animals eating it.

REPRODUCTION
Seed burrs contaminate wool and are spread by sheep.

CONTROL
Cultural control: Burning or grubbing of isolated plants before flowering.

Biological control: Studies have been undertaken by the CSIRO with various agents.

Chemical control: Should be done when the plant is actively growing before seed development. The following herbicide is registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 500g/L	3L		No	Apply in autumn when at seedling stage. Will damage clover and other forbs/herbs.
MCPA 750g/L	2L	270mL		
MCPA 340g/L & dicamba 80g/L	4L to 7L	470mL	No	Two applications 4 weeks apart may be required
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L		350mL	Uptake Oil at 500mL/100L or equivalent product	Avoid spraying large areas under trees.

Horsetails *(Equisetum sp.)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Perennial fern ally with erect unbranched, mostly perennial, stems to 1.2 m high. Stems arise from extensive rhizomes.

DISTRIBUTION
Horsetails have been found in a number of sites from Tasmania to Brisbane. Infestations have been recorded north of Sydney at Narrabeen Lakes, Belrose, and at Snake Creek, Bayview Heights, infesting hundreds of square metres along creek lines at these sites.

REPRODUCTION
Spreads primarily by rhizomes and root pieces.

CONTROL
Cultural Control: Physical removal is an option but it is very difficult to remove all the rhizome, so contaminated soil should also be removed.

Plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: An off-label prescription is not available in the ACT. If a large infestation is found then the ACT Parks & Conservation Service will seek an emergency off-label permit from the Australian Pesticides & Veterinary Medicines Authority (APVMA), similar to the NSW off-label permit PER10537. Details below.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
dichlobenil 67.5g/kg	180kg		No	Apply by direct drop hand spreader at a rate of 18 grams product per square metre.

Japanese Honeysuckle *(Lonicera japonica)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Evergreen to semi-deciduous vigorous vine and creeper. Can completely smother tree crowns and trunks.

DISTRIBUTION
Throughout Eastern and Southern Australia. Widespread problem in near coastal bushland areas around Sydney and other large towns. In the ACT it is restricted to wetter sites. Originates from Japan and Korea.

REPRODUCTION
Spreads primarily by plant pieces and seed (birds eat the berries).

CONTROL
Cultural Control: Seedlings can be pulled out – but once the vines become large it is difficult to fully remove the root stock.

Biological Control: There are no biological control agents available at the moment.

Chemical Control:
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Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant (Uptake Oil or equivalent product)	Comments
fluroxypyr 333g/L	n/a	300mL	500mL/100L	

Kochia *(Kochia scoparia) (Bassia scoparia)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Annual herb that grows to 1.5 m high. Has a tumbleweed form.

DISTRIBUTION
Although originally planted for fodder and to help rehabilitate saline soils. Western Australia's Southwest region, Tasmania near Deloraine and Devonport, and isolated occurrences in South Australia, Victoria, New South Wales and Queensland.

REPRODUCTION
Kochia reproduces by seed. The main mechanism for the dispersal of seeds is by the tumbleweed form that the plant uses, once it has dried out.

CONTROL
Cultural Control: Burning, grazing and mechanical removal have worked in Western Australia.

Plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: Consult the NSW Department of Primary Industry.

Lagarosiphon *(Lagarosiphon major)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
A perennial, submerged aquatic herb.

DISTRIBUTION
Small infestations near Melbourne, and Newcastle in New South Wales have been reported in the past. Spread by aquarium trade.

REPRODUCTION
Spread is by pieces of the plant.

CONTROL
Cultural Control: Mechanical removal with suction of fragments can be used. They can be dried out in the sun prior to deep burial.

Plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: None entirely affective as rhizomes are not killed by herbicide. If an outbreak occurs in the ACT then the ACT Parks & Conservation Service will seek advice from NSW or Victorian DPI.

Lobed Needlegrass *(Nassella charruana)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
A perennial, tussock-forming spear grass growing to about 1 m high. The leaves are narrow and rolled inwards.

DISTRIBUTION
A few small infestations on the northern outskirts of Melbourne.

REPRODUCTION
Spread is by seed, mainly by animals, machinery and contaminated soil.

CONTROL
Cultural Control: Chipped-out plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: The rates below are for off-label permit PER 9792 from the Australian Pesticides & Veterinary Medicines Authority (APVMA).

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
glyphosate 360g/L	3L plus 75L to 200L water	1L	Hot-Up at 250mL/100L to allow spraying during dry periods.	Non-Selective. Careful spot-spraying with a lance to reduce spray drift is very effective. Follow-up essential.
fluproponate 745g/L	1.5L to 3L plus 150L water or if aerial spraying add 80L water	100mL to 300mL	For aerial spraying add compatible anti-drift additive.	Do not boom spray in native grassland or native pasture. Check resistance of desirable pasture grasses before boom spraying.

Mexican Feathergrass *(Nassella tenuissima)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
A perennial, tussock-forming grass, similar in appearance to Serrated Tussock when not in seed. When in seed it produces masses of long awned seed creating a flowing long hair like appearance.

DISTRIBUTION
Only naturalised infestation is at Bendora Dam near the Ranger's house. Also found in gardens at Namadgi Visitors Information Centre, a Gordon residence and a Duffy residence. All sites are monitored for seedlings. Planted in gardens across Victoria, NSW, ACT and Queensland – many of these plants have been seized. The search for remaining plants is on-going.

REPRODUCTION
Seed spread by wind, water, animals, machinery and contaminated soil.

CONTROL
Cultural Control: Chipped-out plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control:

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
glyphosate 360g/L	3L plus 75L to 200L water	1L	Hot-Up at 250mL/100L tto allow spraying during dry periods.	Non-Selective. Careful spot-spraying with a lance to reduce spray drift is very effective. Follow-up essential.
fluproponate 745g/L	1.5L to 3L plus 150L water or if aerial spraying add 80L water	100mL to 300mL	For aerial spraying add compatible anti-drift additive.	Do not boom spray in native grassland or native pasture. Check resistance of desirable pasture grasses before boom spraying.

Nettle Tree *(Celtis australis)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Evergreen medium tree

DISTRIBUTION
Grown as a street tree, which has become an Environmental weed.

REPRODUCTION
Berries readily eaten by birds and animals, then dispersed in droppings.

CONTROL
Biological control: No biological control agents have been investigated to date.

Chemical control:

Chemical	Cut Stump Treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L	1:1 – 1:5 glyphosate : water		Cut tree or sapling close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.

Nodding Thistle *(Carduus nutans)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect annual herb, commonly growing 60 – 90cm tall.

DISTRIBUTION
Widespread in SE Australia but main infestations are in the 'Australian Alps'.

REPRODUCTION
New plants arise from seed which is spread by contamination of harvested material, soil or from the pappus around the seed clinging to carriers such as fur, wool, bags, etc.

CONTROL
Cultural Control: Mowing or slashing shortly before flowering prevents seed production but timing is critical.

Biological Control: Three agents have been released. These are the Rosette Weevil, Seed Fly & Seed Weevil. The Seed Fly and Rosette Weevil working together have the greatest impact.

Chemical Control: Use selective herbicides where possible to minimise the occurrence of bare soil areas and maintain competition from other species. Treat actively growing plants in young stages of growth. The following herbicide and rate is registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 500g/L	2.5L plus 30 to 120L water	170mL	Use LI700 at 500mL/100L	Spot spray rate only suitable for very small rosettes.
metsulfuron-methyl 600g/kg, MCPA 500g/L & clopyralid 300g/L	8 grams metsulfuron-methyl, 1.5L MCPA & 70mL clopyralid	5 grams metsulfuron-methyl, 200mL MCPA & 35mL clopyralid	LI700 at 200mL/100L	This will also work on Paterson's Curse & Viper's Bugloss. Expect significant damage to forbs or wildflowers when boom spraying.
metsulfuron-methyl 600g/kg & MCPA 500g/L	8 grams metsulfuron-methyl & 1.5L MCPA	5 grams metsulfuron-methyl & 200mL MCPA	LI700 at 200mL/100L	This will also work on Paterson's Curse & Viper's Bugloss. Expect significant damage to forbs or wildflowers when boom spraying.
MCPA 340g/L & dicamba 80g/L	5.2L	350mL		Apply to seedlings
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	Not applicable	150mL	Uptake Oil at 500mL/100L	

Pampas Grass *(Cortaderia selloana)* & Pink Pampas Grass *(Cortaderia jubata)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Dense tussocky perennial grass to 3m.

DISTRIBUTION
Garden escape in moist areas and has invaded bushland.

REPRODUCTION
Root divisions or windblown seed, in the case of Pink Pampas Grass.

CONTROL
Cultural control: Individual plants can be grubbed out but ensure the rhizomes as well as the crowns are removed. Developed seed heads should be cut off and burnt.

Biological control: No biological control agents have been investigated to date.

Chemical control: Spray in autumn or spring, repeat to kill larger clumps. Large clumps with excessive amounts of dead material should be cut off close to ground level and sprayed when the regrowth reaches 1m in height.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
glyphosate 360g/L	Not advised	1 – 1.3L	Pulse Penetrant or equivalent at 200mL/100L	Non-Selective. Use for spot treatment only. Ensure complete coverage of foliage. Use higher rates on plants over 1 metre tall.

Parrot's Feather *(Myriophyllum aquaticum)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
An aquatic or semi-aquatic perennial herb. The plants form mats of tangled, leafy stems. The leaves are all arranged in rings around the stem, and those submerged in water are larger than those above water. Submerged leaves are in rings of four to six.

DISTRIBUTION
Coastal areas from south-eastern Queensland to near Melbourne and south-western Slopes in New South Wales and northern Victoria. Isolated infestations occur in Tasmania, South Australia and Western Australia. None established in the ACT.

REPRODUCTION
Spread is by pieces of the plant.

CONTROL
Cultural Control: Hand pulling, subsurface cutting, and use of draglines may give useful temporary control, but it is essential to minimise the movement of stem fragments. Any material removed must be disposed of carefully. In small dams it can be controlled by covering the water with black plastic sheeting for several weeks.

Plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: If an infestation is found in the ACT then an emergency off-label permit will be sought from the Australian Pesticides & Veterinary Medicines Authority (APVMA) similar to PER10428 using Weedmaster Duo Dual Salt Technology Herbicide®.

Parthenium Weed *(Parthenium hysterophorus)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Aromatic, annual herb initially forming a basal rosette of leaves but later branched and usually about 0.5-1.5 m tall.

DISTRIBUTION
Queensland, NSW and Northern Territory.

REPRODUCTION
Spread by seed. The seed can be dispersed by both water and by wind. They can be spread by animals and dirty vehicles.

CONTROL
Cultural Control: Chipped-out plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111. Note that hand-pulling of plants without using gloves and facial mask may result in allergic reactions.

Biological Control: Some success with a leaf beetle, Zygogramma bicolorata and a stem moth, Epiblema strenuana causing the most damage. A stem-boring weevil (Listronotus setosipennis), a stem-galling weevil (Conotrachelus albocinereus), a seed-feeding weevil (Smicronyx lutulentus), a leaf-mining moth (Bucculatrix parthenica) and a stem-boring moth (Carmentia ithacae) have also been introduced in a bid to control the species, while two rusts (Puccinia abrupta and P. melampodii) have also been introduced. A sap-sucking bug, Stobaera concinna, has also been released but has not caused significant damage, while another lepidopteran, Platphalonidia mystica has also been released. (Source: www.weeds.gov.au)

Chemical Control: Apply when plants are actively growing.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
dicamba 500g/L	560mL to 1.1L	76mL	Use non-ionic surfactant at label rate	Selective. Grasses not killed. But will kill other forbs/herbs.

Paterson's Curse & Viper's bugloss *(Echium spp.)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect, coarsely hairy annual herb to 1m tall.

DISTRIBUTION
All states but particularly common in pastures of South East Australia. Rosette habit and vigorous taproot make it a strong competitor.

REPRODUCTION
Seeds are spread mainly by the movement of stock and fodder.

CONTROL
Cultural control: Cultural control is difficult due to the plant's strong competitive ability. Small areas can be slashed regularly during flowering to minimise seed production. Hand weeding of small areas reduces soil disturbance.

Biological control: Agents have been released: including the leaf mining moth Dialectica scalariella, Paterson's Curse Crown-boring Weevil Mogulones larvatus, Paterson's Curse Flea Beetle *Longitarsus echii*, & Paterson's Curse Root-boring Weevil Mogulones geographicus. These can weaken the plants – but herbicides are still required to control infestations.

Chemical control: Apply when plants are small and actively growing, preferably in the rosette stage. Use selective herbicides where possible to minimise the occurrence of bare soil areas. The following herbicides and rates are registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 500g/L	1.0L to 1.5L Plus 30 to 120L water	-	No	Boom at early rosette stage. Grasses not killed. But will kill other forbs/herbs.
MCPA 750g/L	960mL plus 30 to 120L water	270mL	Use LI700 at 500mL/100L	Boom at early rosette stage. Grasses not killed. But will kill other forbs/herbs.
metsulfuron-methyl 600g/kg	15 grams plus 150L water	5 grams	LI700 at 500mL/100L or another compatible non-ionic surfactant	Grasses not killed. But will kill other forbs/herbs.
metsulfuron-methyl 600g/kg, MCPA 500g/L & clopyralid 300g/L	8 grams metsulfuron-methyl, 1.5L MCPA & 70mL clopyralid	5 grams metsulfuron-methyl, 200mL MCPA & 35mL clopyralid	LI700 at 200mL/100L	This is also effective on Nodding Thistle.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
metsulfuron-methyl 600g/kg and MCPA 500g/L	8 grams metsulfuron-methyl & 1.5L MCPA	5 grams metsulfuron-methyl & 200mL MCPA	LI700 at 200mL/100L	This will also work on Nodding Thistle.
glufosinate-ammonium 200g/L	1.0 – 3.0L	300mL	No	Apply high rate on mature plants (refer to label). Good control will only be achieved of small and medium sized plants.
dicamba 500g/L	4L plus 110 to 280L water	280mL	Add non-ionic surfactant at label rate	Selective but will kill other herbs/forbs.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L		250mL	Uptake Oil at 500mL/100L or equivalent product	Apply at flowering stage.

Periwinkle *(Vinca major)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
A vigorous ground cover that forms mono-cultures. Smothers other ground-cover plants.

DISTRIBUTION
Has invaded forest, woodland and riparian areas in SE Australia

REPRODUCTION
Spread by stem fragments. Often dumped by home gardeners in remnant bushland where it can establish new infestations.

CONTROL
Cultural Control: Small infestations can be manually removed.

Biological Control: None

Chemical control:

Chemical	Cut-Stump treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L & triclopyr 600g/L		1L glyphosate and 1L triclopyr	Add 200mL/100L of Pulse Penetrant (organosilicone surfactant) or equivalent. Avoid spraying on tree trunks if the Periwinkle has grown around the base of a tree – as this mixture of herbicide can kill trees. Best to pull the Periwinkle back from the tree base before spraying.

Potentilla *(Potentilla recta)*

WONS		Declared Pest Plant		Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
A vigorous low semi-woody shrub with cream coloured Rosaceae type flowers. Forms mono-cultures, smothering other ground-cover plants.

DISTRIBUTION
Invades grasslands/pasture in the high country.

REPRODUCTION
Seed.

CONTROL
Cultural Control: Seedlings can be manually removed.

Biological Control: None

Chemical control:

Chemical	Spot spray rate per 100L water	Comments
metsulfuron-methyl 600g/kg	10g	Add a non-ionic surfactant at the label rate.

Prickly Pears *(Opuntia spp.)*

WONS	X	Declared Pest Plant		Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Shrubby succulents.

DISTRIBUTION
Widespread across Australia.

REPRODUCTION
From stem fragments or fruits. Often dumped – starting new infestations.

CONTROL
Cultural Control: Chipped plants must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Caution: Spines cause injury to animals and humans as they readily pierce the skin and cause irritation.

Biological Control: Cactoblastis moths or Cochineal insects can work on dense populations. The effect of these agents may be limited in colder climates.

Chemical control: See table below.

Chemical	Spot spray rate per 100L water	Comments
triclopyr 600g/L	3L	Add Uptake Oil at 500mL/100L or equivalent product
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	500mL	Do not spray in areas prone to flooding or under trees. Add Uptake Oil at 500mL/100L or equivalent product.

Privets *(Ligustrum spp.)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Evergreen small tree

DISTRIBUTION
Garden plant which has become an Environmental weed.

REPRODUCTION
Berries readily eaten by birds and animals, then dispersed in droppings.

CONTROL
Biological control. No biological control agents have been investigated to date.

Chemical control:

Chemical	Cut Stump Treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L	1:1 – 1:5 glyphosate : water		Cut tree or sapling close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
metsulfuron-methyl 600g/kg		10g	For plants up to 1 metre high only. Add non-ionic surfactant at label rate.

Pyracantha *(Pyracantha spp.)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	

HABIT
Evergreen, sprawling, spiny shrub to 3m.

DISTRIBUTION
Grown as an ornamental shrub which has become a garden escape. Coast and tableland areas of NSW. Forms dense thickets.

REPRODUCTION
Berries readily eaten by birds and animals, then dispersed in droppings.

CONTROL
Cultural control: Large bushes can be pulled out with a tractor and chain. Smaller plants can be cut back and the stumps dug out. Follow up hand-pulling of seedlings is essential. Replant with indigenous species. Promote alternative species for sale by garden centres.

Biological control: No biological control agents have been investigated to date.

Chemical control: Apply herbicides before berry formation when bushes are growing actively. Avoid the use of herbicides during winter as chemical uptake will be very slow and possibly ineffective.

Chemical	Cut Stump Treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L	1:1 – 1:5 glyphosate : water		Cut shrub close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
metsulfuron-methyl 600g/kg		10g	Only effective on small shrubs less than 1m high. Add a compatible non-ionic surfactant at the label rate.

Rhus Tree *(Toxicodendron succedaneum)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
A small to medium-sized deciduous tree growing 2-8 m high with brightly coloured autumn foliage.

DISTRIBUTION
Sydney and NSW Central Coast.

REPRODUCTION
Seed eaten by birds and animals and seed in contaminated soil.

CONTROL
Cultural Control: Chipped plants must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

The plant is toxic so care must betaken not to let skin or eyes be exposed to the plant material.

Biological Control: None

Chemical control:

Chemical	Cut Stump Treatment	Spot spray rate per 100L water	Comments
glyphosate 360g/L	1:1 – 1:5 glyphosate : water		Cut tree or sapling close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.
metsulfuron-methyl 600g/kg		10g	For plants up to 1 metre high only. Add non-ionic surfactant at label rate.

Saffron Thistle *(Carthamus lanatus)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect annual herb, commonly growing 60 – 90cm tall.

DISTRIBUTION
Occurs in all Australian states as a troublesome weed in cereal growing areas, on grazing land and on disturbed sites.

REPRODUCTION
New plants arise from seed which is spread by contamination of harvested material, soil or from the pappus around the seed clinging to carriers such as fur, wool, bags, etc.

CONTROL
Cultural Control: Mowing or slashing shortly before flowering prevents seed production but timing is critical.

Biological Control: No bio-control agents have been released for this species but in some years red-legged earth mites can kill or severely weaken a significant number of plants.

Chemical Control: Use selective herbicides where possible to minimise the occurrence of bare soil areas and maintain competition from other species. Treat actively growing plants in young stages of growth. The following herbicides and rates are registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 500g/L	1.0L to 2.0L plus 30 to 120L water	-	No	Apply at rosette stage. Will kill other forbs/herbs.
MCPA 750g/L	1.35L plus 30 to 120L water	270mL	No.	Apply at rosette stage. Will kill other forbs/herbs.
bromoxynil 200g/L & MCPA 200g/L	60mL / 100 sqm	300mL	No	Broadleaf weed control in established turf. Apply evenly over the area to be treated. Do not mow turf for 2 days after treatment.
clopyralid 300g/L	70mL plus 1.5L MCPA 500g/L	250mL		Apply from rosette to pre-flowering stages.

Salvinia *(Salvinia molesta)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
A free-floating aquatic fern that can grow rapidly to cover the entire water surface with a thick mat of vegetation. The fronds are arranged along the stems in threes.

DISTRIBUTION
Coastal Western Australia, northern Northern Territory, southern South Australia, eastern Queensland, the central coast of New South Wales and at one site in north-east Victoria.

REPRODUCTION
Stem pieces.

CONTROL
Cultural Control: Hand collected or suction-dredged plants must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: The Salvinia Weevil Cyrtobagous salviniae is effective in tropical areas but has little impact in more temperate climates.

Chemical Control: If an infestation establishes in the ACT then the ACT Parks & Conservation Service will seek an emergency off-label permit from the Australian Pesticides & Veterinary Medicines Authority (APVMA) for the use of Nufarm Weedmaster Duo Dual Salt Technology Herbicide® at rates similar to off-label permit 10529.

Scotch Thistle *(Onopordum acanthium)* (and related illyrian and Stemless Thistles)

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect, annual or biennial herbs, up to 2m high, commonly 1-1.2m, whitish-grey, with woolly stems and leaves. First forming a rosette of divided leaves with spiny margins.

DISTRIBUTION
Throughout temperate SE Australia but a particular problem in central and southern tablelands of NSW where control is difficult.

REPRODUCTION
Reproduce by seed but cultivation can spread root pieces, which may grow. The seed attaches to wool, vehicles, clothing etc or it can be a contaminant in hay. The stems, with seed heads attached, can break off and be blown some distance.

CONTROL
Cultural control: Grub out isolated plants ensuring most of the taproot is removed. Young plants can be effectively killed with cultivation. Slashing of elongated stems before seed set is effective.

Biological control: Seed-head Weevil, Stem-boring Weevil, Rosette Weevil, & the Crown Moth.

Chemical control: Use selective herbicides where possible to minimise the occurrence of bare soil areas and maintain competition from other species. Treat actively growing plants in the rosette stages of growth. The following herbicides and rates are registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
MCPA 500g/L	1.5L to 2.0L plus 30 to 120L water	-	No	Apply at rosette stage. Will kill other herbs/forbs.
bromoxynil 200g/L & MCPA 200g/L	60mL / 100m2	300mL	No	Broadleaf weed control in established turf. Apply evenly over the area to be treated. Do not mow turf for 2 days after treatment.
dicamba 500g/L	1.2L plus 110 to 280L water	80mL	Add non-ionic surfactant at label rate	Apply at rosette stage. Will kill other herbs/forbs.
MCPA 340g/L & dicamba 80g/L	2.8L to 4L plus 30 to 120L water	190mL to 276mL		Higher rates on larger rosettes. Will kill other herbs/forbs.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
clopyralid 300g/L & MCPA 500g/L	70mL clopyralid & 1.5L MCPA	250mL		Apply from rosette stage to pre-flowering.

Serrated Tussock *(Nassella trichotoma)*

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Densely tussocky perennial grass to 1m.

DISTRIBUTION
It is a major problem on the tablelands of central and southern NSW.
Serrated Tussock also occurs over other tablelands and slopes of eastern Australia.

REPRODUCTION
By seed on wind and animals, especially sheep. Tends to dominate areas and spreads extensively to surrounds.

CONTROL
Cultural Control: Chipping is effective with isolated plants. Pasture improvement can be used in degraded agricultural areas. Reduced grazing pressure on desirable grasses is effective in providing competition. Do not mow or slash when in seed. Thoroughly clean all mowers and slashers that have operated in Serrated Tussock areas before moving to un-infested areas.

Biological Control: There are no biological control agents available.

Chemical Control: Best times to spray are from April to October. The following herbicides are registered under off-label permit PER9792.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
glyphosate 360g/L	2.8 to 4L plus 75L to 200L water	1L	Hot-Up at 250mL/100L to allow spraying during dry periods.	Non-Selective. Careful spot-spraying with a lance to reduce spray drift is very effective. Follow-up essential.
fluproponate 745g/L	1.5L to 2L plus 150L water or if aerial spraying add 80L water	150mL to 200mL	For aerial spraying add compatible anti-drift additive.	Do not boom spray in native grassland or native pasture. Check resistance of desirable pasture grasses before boom spraying. To prevent Serrated Tussock seeding add glyphosate 360g/L at 380 to 630mL/ha when booming and 335mL/100L when spot spraying.
fluproponate 86.9g/kg (granular form)	15kg			Apply as a dry granular product. Spot application requires 1.5 grams per sqm. Or approx. 1/3 teaspoon.

Senegal Tea Plant *(Gymnocoronis spilanthoides)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Senegal Tea Plant can be a rounded bush up to 1 m tall, or a scrambling form at the edges of waterways and forming dense tangled mats in open water.

DISTRIBUTION
Isolated infestations in waterways from Taree to Dapto in New South Wales. Also recorded in Tasmania, Victoria and WA.

REPRODUCTION
It can spread by both seed and vegetative reproduction.

CONTROL
Cultural Control: Hand pulling often results in regeneration and further spread, but can be effective on small infestations. Physical methods that include the use of heavy machinery combined with chemicals have been found to be effective. Infestations are sprayed with a herbicide to reduce the risk of spreading plant parts. Then 7-10 days later all silt and plant material up to a depth of 1 m is removed by heavy machinery.

Plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: An off-label prescription is not available in the ACT. If a large infestation is found then the ACT Parks & Conservation Service will seek an emergency off-label permit for the use of glyphosate 360g/L (safe aquatic form), combined with the cultural control method listed above.

Spotted Knapweed *(Centaurea maculosa)*

WONS		Declared Pest Plant	X	Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Spotted knapweed is a short-lived perennial herb. The leaf margins are deeply indented or divided nearly to the main rib and have no spines. The slender flower stems grow up to 1 m high bearing single pinkish-purple flowers at the tips.

DISTRIBUTION
It is a major pastoral weed overseas. Only one infestation is known in Australia. This infestation is adjacent to the Cotter Rd near the Cotter Depot. After initial control no more plants have emerged, but the site is monitored annually.

REPRODUCTION
By seed & root pieces

CONTROL
Cultural Control: Chipping is effective with isolated plants. But ensure all root material removed. Do not mow or slash when in seed. Thoroughly clean all mowers and slashers that have operated in infested areas before moving to un-infested areas.

Plants and contaminated soil must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: There are no biological control agents available at the moment.

Chemical Control: No label or off-label prescription is available. If a large infestation is found then the ACT Parks & Conservation Service will seek an emergency off-label permit from the Australian Pesticides & Veterinary Medicines Authority (APVMA).
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St. John's Wort *(Hypericum perforatum)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect perennial, rhizomatous herb; commonly up to 1m tall. Deeply rooted.

DISTRIBUTION
Widespread throughout Southern Australia as an environmental and pasture weed, especially at higher elevations.

REPRODUCTION
Main spread is by seed which is small enough to be wind transported. More commonly however, spread is by water or mud, and in agricultural produce.

CONTROL
Cultural control: Grubbing of plants before flowering (but if root pieces are left it will regrow). Plants are sensitive to competition in young stages or after being set back by cultivation, chemical or biological controls. Grazing with sheep and cattle can be a useful part of integrated control in pasture.

Do not mow or slash when in seed. Thoroughly clean all mowers and slashers that have operated in St John's Wort areas before moving to un-infested areas.

Biological control: Several agents have been released in the ACT including the St John's Wort Beetle (Chrysolina quadrigemina), the St John's Wort Aphid (Aphis chloris) and the St John's Wort Mite (Aculus hyperici). This approach is long term and is meant to supplement traditional control programs not replace them.

Chemical control: Spray when plants are actively growing. Use a selective herbicide where possible. The chemicals and rates below are registered for use in the ACT.

Chemical	Boom Rate	Spot spray rate per 100L water	Surfactant	Comments
fluroxypyr 333g/L	1.8L/ha plus 200L water/ha	300mL	Uptake Oil at 500mL/100L or equivalent product	Selective. Does not kill grasses. Will kill some species of forbs/herbs. Can be used if rain is forecast – but requires at least one hour after spraying before rainfall.
fluroxypyr 200g/L	3L/ha plus 200L water/ha	500mL	Uptake Oil at 500mL/100L or equivalent product	Selective. Does not kill grasses. Will kill some species of forbs/herbs.

Chemical	Boom Rate	Spot spray rate per 100L water	Surfactant	Comments
triclopyr 600g/L		170mL	BS1000 at 100mL/100L or Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Ensure foliage is thoroughly wet.
triclopyr 300g/L & picloram 100g/L		500mL	BS1000 at 100mL/100L or Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Herbicide must be applied when the plants are actively growing. Extra care required near trees or shrubs or close to waterways.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L		500mL	BS1000 at 100mL/100L or Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Apply from flowering to seed set. Extra care required near trees or shrubs or close to waterways.
metsulfuron-methyl 600g/kg & fluroxypyr 333g/L		10g metsulfuron-methyl & 300mL fluroxypyr	Uptake Oil at 500mL/100L	Useful for combined woody weed, Blackberry & St John's Wort control. Limits the second flush of St John's Wort.

Star Thistle *(Centaurea calcitrapa)*

WONS		Declared Pest Plant		Environmental weed		Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Erect, annual or biennial herb to 75cm; usually with a cottony down.

DISTRIBUTION
Common in all eastern Australia; mainly roadsides, wasteland and around cultivated areas.

REPRODUCTION
Dispersal by seeds. Usually mechanical or soil dispersal or adherence to vehicles.

CONTROL
Cultural control: Grubbing of plants ensuring taproot is removed to prevent regrowth. Slashing just before flowering will reduce seed set.

Biological Control. No biological control agents have been investigated to date.

Chemical control: Spray actively growing weeds at early rosette stages. Use a selective herbicide where possible. The following herbicides and rates are registered for use in the ACT.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
bromoxynil 200g/L & MCPA 200g/L	60mL	300mL	No	Broadleaf weed control in established turf. Apply evenly over the area to be treated. Do not mow turf for 2 days after treatment.
dicamba 500g/L	1.6L	100mL	Add non-ionic surfactant at label rate	Apply at rosette stage. Will kill other herbs/forbs.
MCPA 340g/L & dicamba 80g/L	2.8L to 4L	190mL to 276mL		Higher rates on larger rosettes. Will kill other herbs/forbs.

Sweet Briar *(Rosa rubignosa)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	

DISTRIBUTION
A noxious weed throughout South Eastern Australia, it is wide spread in areas of low management levels.

REPRODUCTION
Seeds will germinate at most times of the year. Suckering occurs mainly in spring. The brightly coloured fruit is attractive to many bird species who are the main dispersal agents.

CONTROL
Cultural control: Hand grubbing of isolated plants.

Biological control: Bio-control has been investigated but agents are not specific.

Chemical control:

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Surfactant	Comments
metsulfuron-methyl 600g/kg	10 gms	No	Non-ionic surfactant at label rate	Selective herbicide. Will not kill old large shrubs – these require either cut/dab or can be cut back to ground level and then the new stems and leaves can be sprayed.
glyphosate 360g/L		1:1 - 1:5 glyphosate : water	No	Cut stump: Cut shrub close to ground level and immediately treat the cut surface with glyphosate. Use the more concentrated rates of glyphosate when plant growth is slowing down.

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Surfactant	Comments
triclopyr 600g/L		2:60 with diesel	No	Basal bark spray: For treatment of suckers and seedling up to 5cm basal diameter. Spray or paint bark around the stem to 30cm, wetting thoroughly. Cut stump: Apply to freshly cut stumps of shrubs greater than 5cm in basal diameter. Best results are obtained when stems are cut less than 15cm from ground. Treat stump immediately after cutting.
triclopyr 300g/L & picloram 100g/L	500mL	No	Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Do not use large volumes under trees and do not use in areas prone to flooding.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	500mL		BS1000 at 100mL/100L or Uptake Oil at 500mL/100L or Synertrol Oil at 200mL/100L or Synertrol Horti-Oil at 250mL/100L or equivalent product	Do not use large volumes under trees and do not use in areas prone to flooding.

Tree of Heaven *(Ailanthus altissima)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Small tree.

DISTRIBUTION
Naturalised in areas of low management throughout most of temperate Australia including roadsides, reserves and waterways.

REPRODUCTION
Reproduction mainly from discarded stems or roots. Winged seed can also spread and germinate.

CONTROL
Biological Control: No biological control agents have been investigated to date.

Chemical Control: Treat actively growing plants from full leaf to onset of leaf fall. Bushes should be cut off at ground level and the stumps treated to prevent regrowth.

Chemical	Spot spray rate per 100L water	Cut Stump Treatment	Comments
triclopyr 600g/L	170mL	1:60 with diesel	Basal bark spray: For treatment of suckers and seedling up to 5cm basal diameter. Spray or paint bark around the stem to 30cm, wetting thoroughly. Cut stump: Apply to freshly cut stumps of shrubs greater than 5cm in basal diameter. Best results are obtained when stems are cut less than 15cm above the ground. Treat stump immediately after cutting.

Valerian *(Centranthus ruber* subsp*. ruber)*

WONS		Declared Pest Plant		Environmental weed		Weed of cultivation		Weed of other disturbed sites	X

HABIT
Stout or robust semi-woody tall herb. A herbal medicine.

DISTRIBUTION
Naturalised in Woodlands & Grasslands areas – when they have spread from adjacent home gardens.

REPRODUCTION
Reproduction from seed or dumped plant material.

CONTROL
Cultural control: Young plants can be chipped out – but minimise soil disturbance as this favours Valerian and other broadleaf herbaceous weeds. Maintain a strong, dense perennial grass cover – which will include grazing control (rabbits, kangaroos and livestock).

Biological Control: No biological control agents have been investigated to date.

Chemical Control:

Chemical	Spot spray rate per 100L water	Surfactant	Comments
metsulfuron-methyl 600g/kg	10g	Add a non-ionic surfactant at the label rate.	

Verbascum *(Verbascum thapsus)*

WONS		Declared Pest Plant		Environmental weed	X	Weed of cultivation	X	Weed of other disturbed sites	X

HABIT
Stout or robust tall herb.

DISTRIBUTION
Favours overgrazed areas but can invade and smother un-disturbed areas.

REPRODUCTION
Reproduction from seed.

CONTROL

Cultural control: Rosettes can be chipped out – but minimise soil disturbance as this favours Verbascum and other broadleaf herbaceous weeds. Maintain a strong, dense perennial grass cover – which will include grazing control (rabbits, kangaroos and livestock).

Biological Control: No biological control agents have been investigated to date.

Chemical Control: Two main options. One involves spraying and the other using a wick wiper/weed wand (see below). Both are done at the rosette stage.

Chemical	Boom spray rate per ha	Wick wiper – weed wand	Spot spray rate per 100L water	Comments
glyphosate 360g/L	Not advised	1L in 2L water	Not advised	Apply carefully to rosette – avoid damaging any surrounding grass cover.
metsulfuron-methyl 600g/kg	20g plus 200L water	No	5g	Pulse Penetrant at 200mL/100L or other compatible non-ionic wetter/surfactant. Apply before stem elongation.
triclopyr 300g/L, picloram 100g/L & aminopyralid 8g/L	Not applicable	Not applicable	150mL	Add Uptake Oil at 500mL/100L
metsulfuron-methyl 600g/kg, MCPA 340g/L & dicamba 80g/L	15g metsulfuron-methyl and 4L (MCPA & dicamba) plus 200L water			When Verbascum and Horehound need to be targeted together. Add LI700 at 500mL/100L water and Pulse Penetrant at 200mL/100L or other compatible non-ionic wetter/surfactant. Apply before stem elongation.

Water Lettuce *(Pistia stratiotes)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Lettuce-like, free-floating, mat-forming, perennial aquatic herb with leaves in rosettes up to 30 cm in diameter.

DISTRIBUTION
Eastern Australia.

REPRODUCTION
Vegetatively and by seed.

CONTROL
Cultural Control: Hand collected or suction-dredged plants must be bagged and buried at a Special Burial Site. The site must be 2 metres deep away from watercourses and be recorded (GPS) as a contaminated site. For this reason it is best to make use of a Special Burial Site at Mugga lane land-fill. These can be arranged via the landfill contractor – Thiess Tel: 6232 7111.

Biological Control: Biological control through insects (including weevils and nocturnal moths) and fungal pathogens have been effective (Source: www.weeds.gov.au)

Chemical Control: Apply from mid-summer to winter.

Chemical	Boom spray rate per ha	Spot spray rate per 100L water	Surfactant	Comments
glyphosate 360g/L (safe aquatic form)		1L to 1.3L	No	Higher rate on dense infestations.

Willows *(Salix spp.)* (Except Weeping Willow, Pussy Willow and Sterile Pussy Willow)

WONS	X	Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Wide range of species from shrub form to medium sized tree.

DISTRIBUTION
It is a major problem from the slopes to tablelands to the coast.

REPRODUCTION
By seed (some species) and vegetatively from twigs and branches

CONTROL
Biological Control: Willow Sawfly larva was an accidental introduction and can cause a lot of damage.

Chemical Control.: One or a combination of the following methods can be used for the poisoning of Willow trees in riparian areas.

Poisoning prior to tree removal is recommended to prevent regeneration of the branches that are broken-off during the removal process and to ensure a thorough kill of the tree. This approach is essential for the Crack willow (Salix fragilis).

If poisoning cannot be carried out prior to tree removal, then it is essential that all material broken off during the removal process be manually removed from the creek bed and banks.

PRODUCT: glyphosate 360g/L (safe aquatic form).

PROCEDURE:
Before tree trunk removal
Where possible all trees with stems greater than 10cm diameter should be pre-treated using the stem injection method. Stem injection method (frill method): Cut horizontal frills or notches by making 5cm long downward axe cuts through the bark and into the sapwood. Space cuts 5-8cm apart. Cut two frill rings (30cm apart) around the base of the tree approximately one metre above ground level. On multi stemmed trunks make a frill cut around each trunk and a second frill close to ground level and treat each cut immediately with glyphosate 360g/L (safe aquatic form). The willow tree should not be removed for a minimum period of 14 days following treatment. Rate: glyphosate 360g/L (safe aquatic form) - 1:1

Immediately after tree trunk removal
Cut stump treatment <20cm diameter: Cut stump as close as possible to ground level and treat the freshly cut surface immediately with the glyphosate 360g/L (safe aquatic form). On multiple trunk trees ensure each trunk is treated. Rate: glyphosate 360g/L (safe aquatic form) - 1:1

Treatment after the trunk has been removed from trees >20cm diameter
Stem Injection method (frill method) and cut stump treatment: Re-cut the trunk as close as possible to ground level and cut notches into the sapwood area on top of the stump. Immediately treat the sapwood area and cut surface with glyphosate 360g/L (safe aquatic form). Then cut horizontal frills or notches around the base of the tree stump and major trunk stumps. Make the frills by cutting 5cm long downward axe or chainsaw cuts about 5-8cm apart through the bark and into the sapwood.

Immediately treat the frill cuts with glyphosate 360g/L (safe aquatic form). On multiple trunk trees ensure each trunk is treated. Rate: glyphosate 360g/L (safe aquatic form) - 1:1

Treatment for regrowth from a cut stump or willow saplings up to 2m in height
The control method(s) selected will depend on the type of regrowth to be treated and situation.
(i)Foliar spray: Foliar spray regrowth or saplings up to 2 metres in height taking care not to contaminate water with the spray. Where regrowth from a cut stump is taller than 2 m in height, cut back the foliage and spray the regrowth. Rate: glyphosate 360g/L (safe aquatic form) - 1.3L per 100L water or an alternative over non-potable water is metsulfuron-methyl 600g/kg as a foliar spray at 10g/100L. This is an off-label permit.

(ii) Cut stump treatment: Where practical regrowth from cut stumps may be treated by recutting the stump and applying glyphosate to the cut surface. Rate: glyphosate 360g/L (safe aquatic form) - 1:1.

(iii) Stem injection treatment (frill method): Stem injection may be used to control regrowth in situations where it is not practical to recut the stump or apply a foliar treatment. Rate: glyphosate 360g/L (safe aquatic form) - 1:1

COMMENTS: It is essential that herbicide applications are carried out immediately (within 20 seconds) following the cutting of frills and cut stumps.

EQUIPMENT: A splatter gun applicator or similar is suitable for the stem injection and cut stump treatments. The gun is similar to a drench gun and delivers a calibrated dose of herbicide. The tank holds 2 litres of herbicide.

Yarrow *(Achillea millefolium)*

WONS		Declared Pest Plant		Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Semi-woody/herbaceous perennial to 60cm with distinctive feathery leaves and white flowers and sage like smell when leaves are crushed.

DISTRIBUTION
The High Country of SE Australia.

REPRODUCTION
Vegetatively (stolons) and by seed.

CONTROL
Cultural Control: Seedlings can be grubbed by hand or chipped.

Biological Control :Unknown.

Chemical Control: This uses off-label permit PER13420.

Chemical	Spot spray rate per 100L water	Surfactant	Comments
metsulfuron-methyl 600g/kg	10g	Add a non-ionic surfactant at the label rate.	.

Yellow Bamboo *(Phyllostachys aurea)*

WONS		Declared Pest Plant	X	Environmental weed	X	Weed of cultivation		Weed of other disturbed sites	X

HABIT
Semi-woody spreading rhizomatous plant. Stems can grow over 5 metres tall.

DISTRIBUTION
Widespread Environmental weed near urban settlement.

REPRODUCTION
Vegetatively.

CONTROL
Cultural Control: The mechanical removal of entire Bamboo clumps using a back-hoe is recommended wherever possible.

Biological Control :Unknown.

Chemical Control: When plants are actively growing and not under stress.

PROCEDURE
Spot spray entire clumps including suckers and regrowth: glyphosate 360g/L at 1 litre / 100 litres water. Apply to actively growing foliage and/or regrowth which is between 1m and 2m tall. Good spray coverage is essential, but care should be taken to avoid spray contacting nearby plants and lawns. Add Pulse Penetrant at 200mL/100L.

Stem treatment – glyphosate 360g/L at 1 litre / 6 litres water
Large Bamboo clumps can be cut down to within 10-30 cm of ground level and pour the mixture down the hollow stem or paint on the freshly cut surface and green stem.

Repeated applications of glyphosate 360g/L are usually required to obtain effective control. A number of residual herbicides are available to control Bamboo, but these can also kill nearby plants.

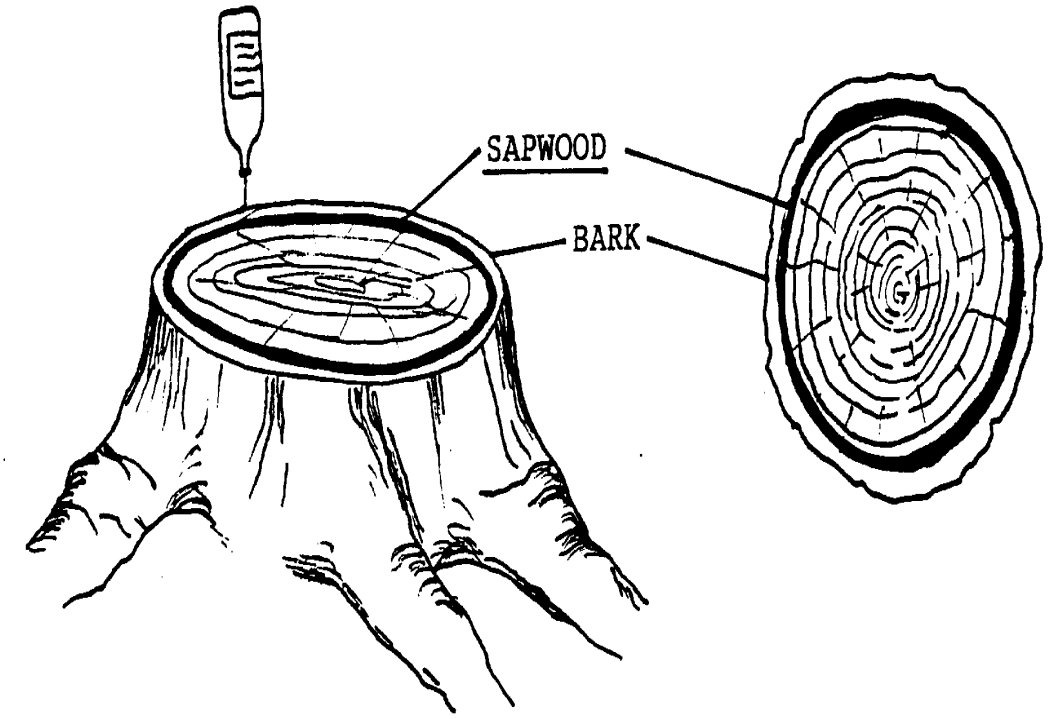
Poisoning Of Cut Stumps

TREATMENT
Glyphosate 360g/L applied at 1:1 up to 1:5 parts water. Use the more concentrated rates of glyphosate when plant growth is slowing down.

PROCEDURE
Trees/shrubs should be cut as close as possible to ground level and
the cut surface treated immediately with the herbicide mixture. The chemical can be applied using splatter gun, spray, swab, brush, squirt bottle or knapsack.

The plant's natural protective mechanism acts very quickly to seal off the cut surface and this stops chemical penetration into the sap stream. It is very important to treat the conducting tissue (sapwood) of the plant first. This is located in a band just under the bark as shown in the diagram below. The longer treatment is delayed, the poorer will be the result.

Apply the herbicide mixture to the sapwood.



The treatment may not work if it is applied longer than 1 minute after the cut has commenced. If it is a large tree and the cut is going to be longer than 1 minute then a saw cut should be run around the tree and treated with the herbicide before the tree is cut down. Ten minutes later fell the tree cutting slightly below the first cut and then apply herbicide to the freshly cut stump.

Useful Telephone Numbers

ChemClear	02 6230 4799
Emergency Services	000
EPA	13 2281
Health Protection Service	02 6205 1700
drumMuster	02 6241 9411
Parkcare Officer ACT Parks & Conservation Service	02 6207 5555
Pest Management Officer TAMS - City Services	13 2281
Senior Weed Management Officer Natural Resource Protection Unit ACT Parks & Conservation Service	0411 166 340
Senior Vertebrate Pest Management Officer Natural Resource Protection Unit ACT Parks & Conservation Service	02 6207 2135