



Photograph: Lynn Broos

Guidelines for Safe and Effective Herbicide Use Near Waterways

The control and management of weeds near waterbodies is a challenge faced by many landholders across Tasmania. Waterbodies are particularly sensitive to herbicide contamination, so the decision to apply herbicides in the vicinity must be taken with great care.

Weed control near waterbodies requires a long-term commitment to eradication, perhaps 5–10 years or more, as the seed banks of many 'woody' weed species (eg blackberries, gorse) may remain viable for decades. Weeds can also spread along watercourses, making their control difficult. A staged, planned approach to weed control, alongside a program to re-establish native riparian species, is necessary to ensure the safe restoration of riparian areas. Restoring native vegetation helps to reduce the presence of weed species, ensures the stability of banks, shades the waterway (which helps prevent future weed invasion), and provides habitat for local fauna.

Definitions

For the purposes of this guideline, the following definitions apply:

Riparian land	Any land that adjoins, directly influences, or is influenced by a body of water at any time of the year.
Waterbody	Includes natural watercourses (streams, creeks, rivers), natural wetlands, ponds, lagoons, constructed drainage channels, dams and ponds, reservoirs and lakes.
Permanently inundated/perennial	These areas have water all year round.
Occasionally inundated/intermittent	These areas have water some time of the year.
Rarely inundated/ephemeral	These are areas that rarely contain water (eg areas that flood on rare occasions).
Toxicity	The inherent poisonous quality/qualities of a substance, measured by what size dose is likely to cause harm (acute toxicity is measured by the amount of active ingredient - mg/kg live body weight - required to kill 50% of a test group of animals - this is called LD50).

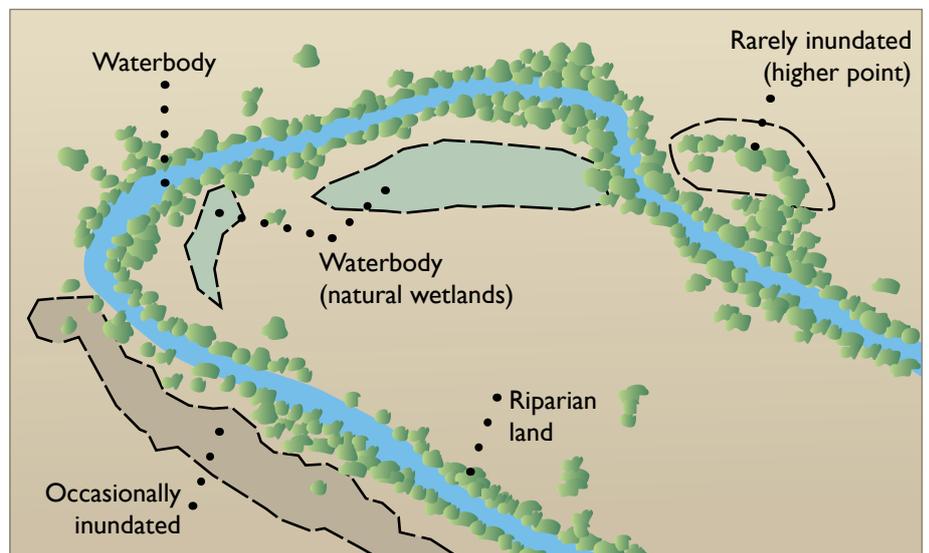


Figure 1: Appropriate and effective herbicide usage near water requires consideration of specific situations

A Planned Approach

Assess your site

What type of waterbody is it?

If your site is permanently inundated, you need to consider very carefully the choice of herbicide, recognising the risk to your aquatic ecosystem and the danger that the herbicide may pose to the surrounding environment. You also need to identify points of access to the site.

If your site is occasionally or rarely inundated, choose a time when the chance of rainfall is low and therefore the risk of runoff contaminated with herbicide is likely to be low. Figure 1. illustrates the different zones found in aquatic situations which may affect herbicide use.

What types of weeds are present?

Identify the species of weed and the extent of the infestation. Table 2 details the recommended herbicide control for a number of riparian weeds, the method and time of year for application. It also suggests alternatives to the use of chemicals.

Do the weeds have value at the site?

Consider whether the weeds are serving a useful purpose at the site. They may be acting as a buffer to control erosion, or as a filter to promote water quality. They may have a value to animal species as a source of food or shelter.

If you believe that you have native plants or animals that might be adversely affected by your proposed weed control, seek professional advice.

You may be able to stage the removal of weeds to minimise any impact on erosion or on animal life. You will almost certainly need to restore the habitat once weeds have been eradicated.

Are native species present at the site?

Identify any native plant species at your site. You may need to protect these species from overspray or mark them to prevent accidental spraying. These native plants will be the starting point to restoring the riparian zone.

Choose your control method

Landholders should always consider non-chemical solutions as a preferred option before deciding to use herbicides. These include biological control (eg by introduction of gorse mite, see photo below), slashing, mulching, controlled grazing (controlling timing, intensity and frequency), or hand removal. Often a combination of chemical and non-chemical methods is most appropriate. Whichever method or combination of methods is used, it is important to consider the potential negative impacts on the environment and limit these as much as possible.



Biological agents such as Gorse spider mite may be options for use near waterways, courtesy of Tasmanian Institute of Agriculture.

Understanding herbicides

Herbicides are designed to control and eradicate pest plants ('weeds'). However, it is important to realise that many herbicides have toxic effects in aquatic ecosystems. Native plants, invertebrates, frogs and fish may be harmed by herbicides. The inappropriate use of herbicides may also cause significant risks to human health where water is pumped from a bore for domestic use, or flows to reservoirs.

Herbicides can enter waterbodies either directly through spray or spray drift, or they can move into waterbodies via surface water run-off or leaching and sub-surface draining.

Herbicides can be broadly classified according to their chemical structures and modes of action. Table 1 shows the three major types of herbicide.

Table 1: Herbicide classification

Pre-emergent (residual)	These herbicides are designed to inhibit the germination of pest plants. They are therefore applied before the pest plant germinates and are often residual in the soil for long periods. They are generally not considered to be safe for use near waterbodies and are not recommended for use due to their persistence in the environment.
Knockdown non-selective	These herbicides are designed to be applied directly to the target pest plant, either through being sprayed onto foliage or applied directly to the cambium layer using any of the direct application methods described in Table 3. They may vary in mode of action and some may persist as residues in the environment.
Selective	Selective herbicides are designed to act on only one type of pest plant. Generally, selective herbicides will control either broadleaf (eg capeweed), grasses (eg phalaris) or woody weeds (eg broom). These herbicides are useful when the focus may be on controlling a particular weed species (eg phalaris amongst native shrubs). These herbicides may persist as residues in the environment.

Herbicides applied to the edge of a waterbody, or in wetted areas around its edge, must be registered for use in aquatic environments by the Australian Pesticides & Veterinary Medicines Authority (APVMA).

Consider the tools available to mitigate against offsite movement of your pesticide

PIRI-Tas

PIRI-Tas is a simple screen tool that predicts the off-site migration potential of pesticides into surface or ground-water. PIRI-Tas assesses both the likelihood of off-site-migration and the risk to different species based on the toxicity of the pesticide to a range of aquatic organisms.

PIRI-Tas is a risk indicator and uses a risk-based approach to decision making by taking into consideration a range of factors associated with site conditions, soil and environmental scenarios, pesticide properties, application rates and time of spraying as well as considering impacts on target species being protected by receiving environments. PIRI-Tas outputs can also be used to construct annual spray schedules to assist with future planning.

PIRI was first developed by CSIRO and is being used both nationally and internationally by a number of organisations. PIRI-Tas CD's and onsite training are available for free through the DPIPWE to key users of chemical pesticides, including those in the agriculture, forestry, amenity, glasshouse and municipal sectors.

Further information is available at <http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/SSKA-7JA3N4?open>

Consider integrated pest management (IPM)

Integrated pest management (IPM) is a planned approach that coordinates environmentally acceptable methods of pest control with careful and minimal use of toxic pesticides. IPM programs are based on a comprehensive assessment of local conditions, including factors such as climate, season, the biology of the pest species, and government regulations.

Strategies employed may include the staged removal of weeds, biological control and re-planting of riparian areas with native species to discourage the regeneration of weeds.

Consult and plan

Draw up a calendar for action. The time of year when herbicides will be most effective on the weed should be a major influence on the make-up of this calendar. Herbicides are generally most effective during the growing season of the weed rather than when it is dormant or approaching dormancy. The staged removal of weeds over several seasons may be less disturbing to your aquatic environment and minimise any adverse impact on fauna.

Consult with neighbours who may be affected by your weed control operation, especially if you think there is any risk of spray drift to adjoining properties or downstream. You may also decide to seek advice from experts before taking further action, or approach commercial spray contractors to assess your particular situation.

If the work involves a significant length of river or multiple properties it is advisable to develop a plan that covers all aspects of the weed control work and restoration, including potential risks. You should also be mindful of:

- feasibility/practicability of the work
- physical characteristics of the job site
- optimal pest control method, including alternatives to herbicides
- characteristics of the herbicide (physical, chemical and environmental)
- buffer zones
- the possibility of spray drift and other off-target migration
- weather conditions.

Do you need to spray?

It is recommended that only trained, licensed contractors carry out spraying operations near waterbodies because of the sensitivity of these environments. Check that they have experience and an understanding of the issues around using herbicides near aquatic environments.

The following points are critical to the application of herbicides near waterbodies:

- Always follow the label
- When you are working near the edge of a waterbody, direct the spray away from the waterbody where possible.
- Spray only to the extent of covering foliage with droplets.
- Spray when weather is calm; strong winds may carry herbicide drift into waterbodies.
- Use a flat fan nozzle and a low pump/spray pressure to reduce the likelihood of spray drift.
- Do not spray when rainfall is forecast within four hours as herbicide can be washed off the pest plant and run off into aquatic ecosystems.

Appropriate herbicides and application

The type of weed problem will determine both the type of herbicide and its application method. Table 2 shows recommended herbicide and application methods for some common weeds, along with alternatives to herbicide use. Table 3 illustrates application techniques and equipment need to undertake control works.

Uses described in this table are either covered by the respective product label or Off-label Permit No. 13160 issued by the Australian Pesticides and Veterinary Medicines Authority.

Table 2. Common weeds and recommended treatment and herbicides

Area	Weed	Permitted Herbicide (active ingredient)	Example of commercial product (concentration of active ingredient)	Recommended Herbicide Control Technique	Non-chemical Alternatives
Permanently inundated/ perennial	Submerged and partially submerged plants				
	Parrot's feather (<i>Myriophyllum aquaticum</i>)	Glyphosate (registered for aquatic use only) Don't add surfactants!	Roundup Biactive® or Weedmaster Duo®	Foliar spray	Hand removal and excavation (with roots/rhizomes) can be used as part of a well planned approach. Care must be taken to avoid losing fragments
	Egeria (<i>Egeria densa</i>)				
	Canadian Pondweed (<i>Elodea canadensis</i>)				
	Cumbungi (<i>Typha</i> spp)				
	Glyceria (syn. Poa aquatica or reed sweet grass) (<i>Glyceria maxima</i>) NB Take extreme caution not to spread Glyceria seed through soil transport (eg on machinery)			Foliar spray (combine with dense local native species revegetation for long-term results through stream shading) Wiper	Clearance or drainage of growth area (combine with dense re-vegetation of local native species for long-term results through stream shading)
	Woody weeds				
	Blackberry (<i>Rubus fruticosus</i>)	Glyphosate (registered for aquatic use only) Don't add surfactants!	Roundup Biactive® or Weedmaster Duo®	Cut and paint with Roundup Biactive® or Weedmaster Duo®	Hand removal (small plants) Controlled grazing (goats or sheep only) can be effective Bio-control (eg gorse mite, blackberry rust) where other techniques are not suitable Gorse mulching combined with follow-up grazing and revegetation on mulched sites
	Gorse (<i>Ulex europaeus</i>)				
	Trees				
Hawthorn (<i>Crataegus monogyna</i>)	Glyphosate (registered for aquatic use only) Don't add surfactants!	Roundup Biactive® or Weedmaster Duo®	Cut and paint Drill or stem injection Axe or frill and paint Foliar spray hawthorn and crack willow (only spray to a height of 2m)	Hand removal (small plants) Controlled grazing can assist in limiting Hawthorn regrowth and thicket density	
Crack Willow (<i>Salix fragilis</i>)					
Sycamore (<i>Acer pseudoplatanus</i>)					

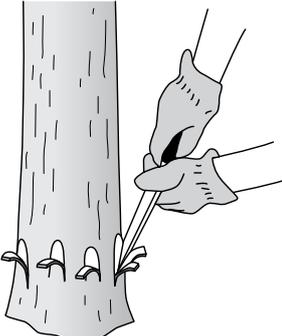
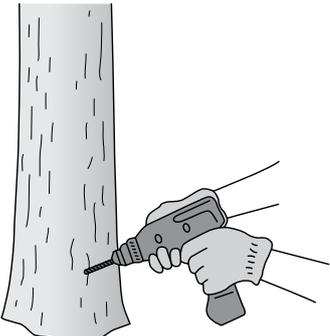
The product trade names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product does not imply endorsement by DPIPWE over any other equivalent product from another manufacturer.

Table 2. Common weeds and recommended treatment and herbicides continued

Area	Weed	Permitted Herbicide (active ingredient)	Example of commercial product (concentration of active ingredient)	Recommended Herbicide Control Technique	Non-chemical Alternatives
Occasionally or rarely inundated sites	Woody weeds				
	Blackberry (<i>Rubus fruticosus</i>)	Metsulfuron-methyl Triclopyr Triclopyr + Picloram	eg Associate or Brush-Off® eg Garlon 600® eg Grass-up™ or Grazon Extra®)	Foliar spray	Hand removal (small infestations) Controlled grazing by goats can be effective Bulldoze and deep cultivate (in suitable circumstances) Bio-control (a rust with limited impact)
	Gorse (<i>Ulex europaeus</i>)	Glyphosate (registered for aquatic use only) Triclopyr Triclopyr + Picloram	eg Roundup Biactive® or Weedmaster Duo® eg Garlon 600® eg Grass-up™ or Grazon Extra®)	Cut and paint Foliar spray, preferably Garlon 600®	Mulching/bulldozing/slashing combined with follow-up grazing and revegetate on mulched sites Bio-control (e.g gorse mite) where other techniques are not suitable
	English Broom (<i>Cytisus scoparius</i>)	Glyphosate (registered for aquatic use only). Metsulfuron-methyl Triclopyr herbicide Triclopyr + Picloram	eg Roundup Biactive® or Weedmaster Duo® eg Associate or Brush-Off® eg Garlon 600® eg Grass-up™ or Grazon Extra®)	Cut and paint. Foliar spray, preferably Garlon 600® (only if under 2m in height)	Hand removal. Mechanical removal (eg rip or bulldoze) Mulching/bulldozing/slashing of hawthorn combined with follow-up grazing and revegetate on mulched sites
	Montpellier Broom (<i>Genista monspessulana</i>)				
	Trees				
	Hawthorn (<i>Crataegus monogyna</i>)	Glyphosate (registered for aquatic use only). Metsulfuron-methyl Triclopyr herbicide Triclopyr + Picloram	eg Roundup Biactive® or Weedmaster Duo® eg Associate or Brush-Off® eg Garlon 600® eg Grass-up™ or Grazon Extra®)	Cut and paint Foliar spray, preferably Garlon 600® (only if under 2m in height)	Hand removal Mechanical removal (eg rip or bulldoze) Mulching/bulldozing/slashing of hawthorn combined with follow-up grazing and revegetate on mulched sites
	Sycamore (<i>Acer pseudoplatanus</i>)	Glyphosate (registered for aquatic use only)	eg Roundup Biactive® or Weedmaster Duo®	Stem injection, cut and paint (plus foliar spray for young plants)	Hand removal Bulldoze and revegetate Plough-in small plants
	Herbaceous plants				
	Ragwort (<i>Senecio jacobaea</i>)	MCPA Metsulfuron-methyl	eg MCPA 500 or L.V.E Agritone eg Associate or Brush-Off®	Foliar spray	Hand removal Controlled grazing (sheep) Ploughing/cultivation (combine with dense revegetation of local native plants for long-term results through shading)
Paterson's curse (<i>Echium plantagineum</i>)					
Thistles (eg <i>Cirsium arvense</i>)					

More information on weed identification and weed control can be found at www.dpipwe.tas.gov.au/weeds

Table 3. Herbicide application techniques

Illustration	Method	Type of weed	Equipment Required	Notes
	Foliar Spray	Herbaceous plants, Woody weeds	Knapsack Vehicle mounted tank Herbicide mix Personal protective equipment (see product label)	Ensure herbicide is being applied at right concentration and rate to cover the foliage of the pest plant with fine droplets and avoid run-off. A flat fan nozzle and low pump pressure will assist in reducing spray drift
	Cut and paint	Woody weeds, shrubs and trees	Saw, chainsaw, loppers Herbicide mix Personal protective equipment (goggles and gloves as a minimum) Brush/sponge for herbicide application	Ensure herbicide is applied quickly to cut stump (within 15 seconds in most cases) Apply during active growth period of plant for best results Do not apply herbicide to the point of run-off
	Frilling	Shrubs and trees	Axe, hatchet Herbicide mix Personal protective equipment (goggles and gloves as a minimum) Brush for herbicide application	Frill trunk thoroughly, also treat major surface roots where visible Expose sapwood and apply herbicide to it immediately For deciduous species, apply during active growth period
	Drill and poison	Shrubs and trees	Drill Application bottle, injection gun Herbicide Personal protective equipment (goggles and gloves as a minimum)	Drill to sapwood only and apply herbicide to drill hole immediately Drill and fill major surface roots where appropriate For deciduous species, apply during active growth period

Illustrations: Brett Littleton ILS Design Unit

After Spraying

Clean up

Equipment should always be cleaned in a safe location where spills can be contained and will not result in environmental harm. Using water to clean equipment will further dilute any residual herbicide to low levels, and the resulting solution is best sprayed onto a lawned area or bare ground taking the following precautions:

- Do not apply wash-water to the point of saturation so that run-off occurs.
- Do not apply wash-water along boundary fence lines as this will increase the chance of herbicides escaping from your property.
- Do not dispose of wastewater into areas where children play, or pets have access, as low levels of herbicide are still likely to be present.
- Do not deposit wastewater where it will run into waterways, drainage lines or stormwater systems.

Disposal

If you do happen to have surplus spray mix or herbicide waste, label it with the herbicide name, including any risk and safety information displayed on the original label. Store it safely until it can be disposed of appropriately. Contact a chemical collection organisation eg Chem Clear.

You must follow label directions for the disposal of wastes and herbicide containers. Only dispose of waste herbicides at authorised collection centres, such as licensed waste disposal centres.

Do not dispose herbicide waste:

- through sewerage systems, where it can interfere with the sewage treatment process
- down the drain or gutter; where it can pass through the stormwater system and into waterways
- to landfill via dumping or domestic waste, as it can contaminate soil and leach into groundwater and stormwater.

Monitor, evaluate and follow up

Monitor

Observe and keep records of your weed problems and the impact of any measures you take to control them. This could involve:

- the use of visual records, including property maps, aerial and other photography
- the use of a calendar or diary to record when actions were taken.

Evaluate

Evaluate the success of any weed control program by considering the current extent of the weed problem and reviewing your control measures. Important questions might include:

- Is my weed control work going to plan, or do my goals need reviewing?
- What is the appropriate weed control measure now?
- Is there a need for external (expert) assistance?

Follow up

Re-implement weed control actions following the results of your monitoring and evaluation. Continue to monitor this follow-up work, and so begin an ongoing cycle of weed management.

These guidelines have been updated by Kiowa Fenner and are based on guidelines prepared by Michael Noble and Janice Miller.

Important disclaimer

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