Rivercare

Guideline for Safe & Effective Herbicide Use Near Water

Herbicides can accumulate in and impact on waterways and wetlands

Introduction

Riparian land (land adjacent to a waterway) and aquatic areas in Tasmania's agricultural regions are often dominated by introduced plant species such as willows, sweet reed grass, cumbungi, gorse, hawthorn and blackberries. These weeds replace native riparian species and often impact upon the way that a stream behaves - leading to problems such as stream bank and bed erosion or channel blockage. In addition to these 'high profile' riparian weeds, other weed species include various shrubs (eg. Spanish heath, broom and briar rose) and grasses (eg. Yorkshire fog, phalaris and cocksfoot). Figure 1 illustrates a riparian site with a significant presence of weed species.

Weeds are good indicators of land and water management problems. They dominate where there is increased sunlight resulting from loss of riparian vegetation and when high levels of nutrients and sediment are entering the waterway. There is little point in spraying cumbungi in a dam each year whilst stock and manure continue to enter the dam. In such situations, herbicide treatment is a short-term treatment requiring repeated applications until the causal influences are addressed.

It is very important to think long-term when managing riparian and aquatic areas – perhaps 5-10 years or more. Gradual and consistent weed control and re-establishment of local native plant species are integral components for sustainable management of riparian areas. Local native plants assist in: reducing the presence of weed species (shading and competition); the long-term stability of banks; shading of the waterway; and provision of habitat.

Wherever feasible, weed control should be carried out utilising non-herbicide methods. These include: biological control (eg gorse mite); slashing; mulching; hand removal; and controlled grazing. Often, a combination of herbicide and non-herbicide based methods is most appropriate. Whichever method or combination is used, it is important to consider the potential impacts on the environment and limit these as much as possible. Figure 2 presents an example of specific situations to be considered when planning herbicide usage.

Figure 1.
Gorse and crack willow amongst native vegetation on the South Esk River. (Photo courtesy of Reece Luxton, Tamar Valley Weed Strategy)

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DEFINITIONS

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

Riparian	Any land that adjoins, directly influences, or is influenced by a body of water. [1]
Aquatic	Areas of actively flowing channel and wetlands.[2]
Commonly inundated sites	Riparian channels, banks, floodways, dry billabongs and backwaters, commonly flooded floodplains.[2] Flooded at least once a year.
Occasionally or rarely inundated sites	Riparian areas/floodplains where only occasional floods are experienced.[2] For example flooded less than once a year.
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 - is required to kill 50% of a test group of animals - this is called LD50).[3]

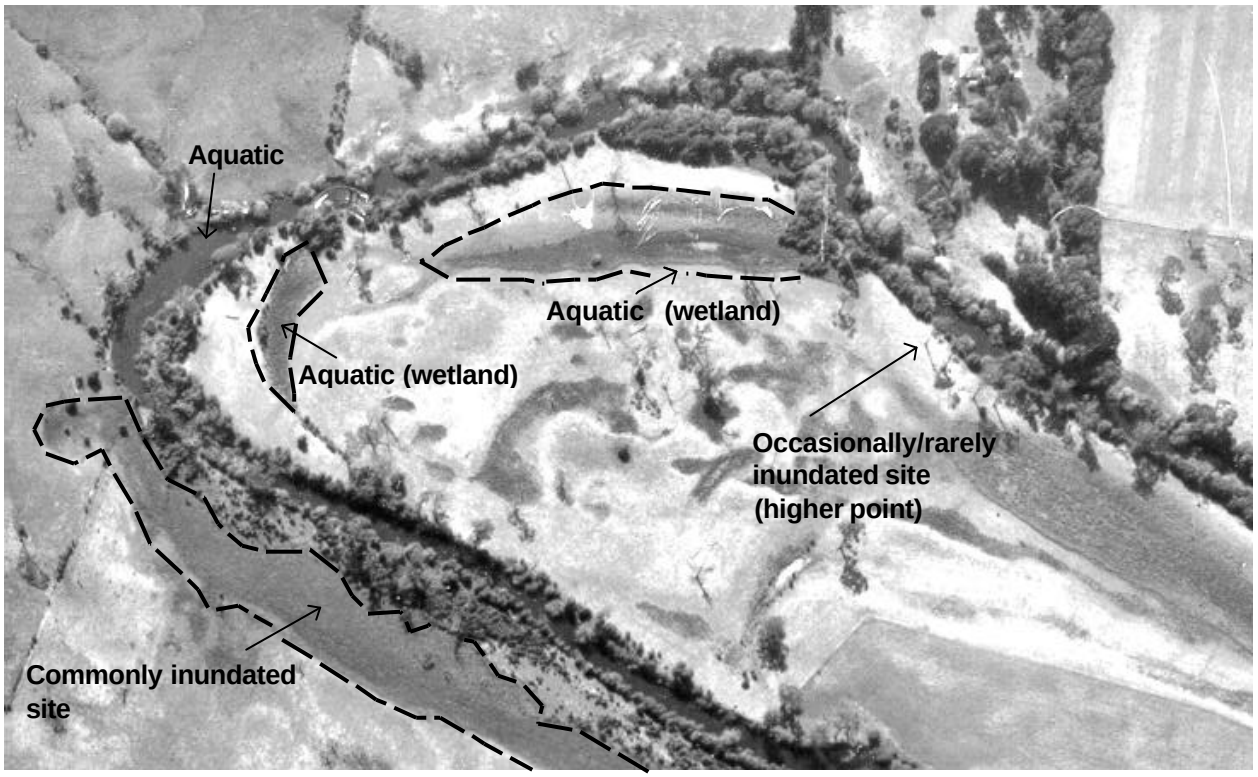

Figure 2: Appropriate and effective herbicide usage near water requires consideration of specific situations

CONSIDER YOUR WEED ISSUE

Consider some key questions about your riparian area before continuing:

Do weed species play an important role on your riparian land?

There are circumstances where weeds play an important role stabilising or protecting the stream bank, shading the stream, and providing important habitat in the form of cover or nesting sites. For example, removing blackberry from a riparian zone may expose the stream bank to erosion. In these situations it is important to undertake weed removal in stages and ensure that revegetation occurs immediately after weed removal.

What is the extent of your weed issue?

What is your long-term goal in managing the weed(s) and is it worthwhile and realistic? In some circumstances - with blackberry for example - the money, time and/or environmental impact required to bring the weed under control may not be justified.

Have you programmed long-term maintenance into your schedule?

Treatment of weeds is generally futile if ongoing maintenance is not undertaken. Will you have the time/money required in future years to maintain the work you are initiating?

SAFE AND EFFECTIVE HERBICIDE HANDLING

Information in this Guideline does not in any way replace or supersede the information on the herbicide product labeller permit (including application rates) or other regulatory requirements. All use must be in accordance with the herbicide product label or a relevant permit. Specific products are named in this document for herbicide impact example purposes only. Toxicity information supplied below refers to "acute toxicity". In many instances (for example with triclopyr) "chronic toxicity" is largely untested.

Information in this Guideline does not in any way replace or supersede herbicide use training. In certain situations, it is a LEGAL REQUIREMENT that persons applying herbicides have undertaken the ChemCert Australia (Tas) Certificate course through Tasmanian Rural Industries Training Board.

ALWAYS CONSIDER OUR WATER WAYS!

It is important to be aware that significant accumulation of herbicides in waterways results from off-stream activities. Some herbicides readily bind with soil particles, which may then be mobilised by water. Whether washed down a paddock or down a street gutter, herbicide-laden run-off will eventually drain into a waterway. A recent study of a US waterway found it contained a concoction of 18 pesticides – the environmental health consequences of so many pesticides mixing are largely unknown.[4] When applying herbicides please consider potential impacts on local waterways. Utilise appropriate herbicides and minimise herbicide use!

APPROPRIATE HERBICIDES AND APPLICATION TECHNIQUES

Prior to using herbicides in a riparian area, ensure you have considered all non-chemical options (for example Figure 3 illustrates a non-chemical alternative – solarisation – being trialed for use on rice grass). If there is no alternative then ensure that appropriate herbicide and application techniques are selected for the site. Refer below and to Table 1. (**Note:** ai = active ingredient in the herbicide.) Many herbicides and surfactants (a product included in or added to herbicide to improve leaf penetration) are toxic to aquatic and riparian plants and animals. These should never be used in the immediate vicinity of a waterway or wetland. For example, pre-emergent herbicides such as atrazine are toxic to aquatic plants and animals including fish and invertebrates.[5]

Figure 3: Solarisation being used to treat rice grass (*Spartina anglica*) in the Rubicon Estuary (Photo courtesy of Julia Butler-Ross).

Atrazine is soluble in water and moves easily in soil. It and a related herbicide Simazine are residual in soil and residues are found in surface and ground waters.[6] **Pre-emergent herbicides are not suitable for riparian use.**

Some herbicides can be used - to greater or lesser degrees - in the vicinity of waterways. Examples are given below. Herbicides that can be used near water are applied using a variety of techniques including foliar spraying and various target specific methods. Herbicide being applied directly to trunks or stems must be directed to the sapwood to maximise effectiveness. Figure 4 illustrates sapwood and other basic zones within a tree. Figures 5-7 illustrate some application methods.

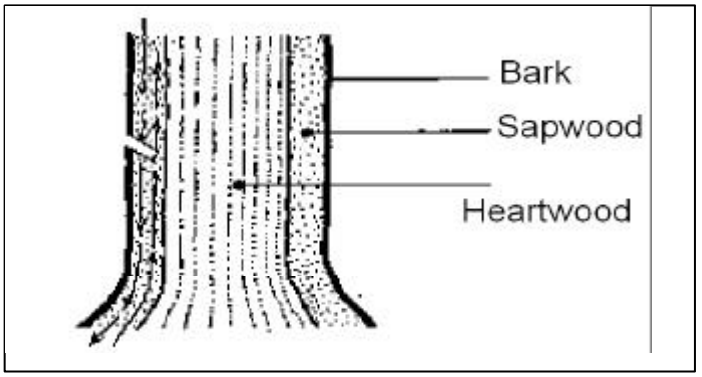

Figure 4: Herbicide being applied directly to trunks or stems must be directed to the sapwood to maximise effectiveness.

Roundup Biactive â, Weedmaster â Duo and Weedmaster 360 â (ai = glyphosate) are non-selective herbicides and currently the only ones registered in Tasmania for use in aquatic areas (for example, where cumbungi is growing within the waterway and herbicide is judged to be the most suitable control technique). Other glyphosate-based products contain surfactants that can be harmful to aquatic organisms. These products should not be used in aquatic areas. Glyphosate is considered slightly toxic to birds, fish, invertebrates and mammals. [7]

You must read and follow the herbicide container label regarding use of Roundup Biactive â, Weedmaster â Duo and Weedmaster 360 â.

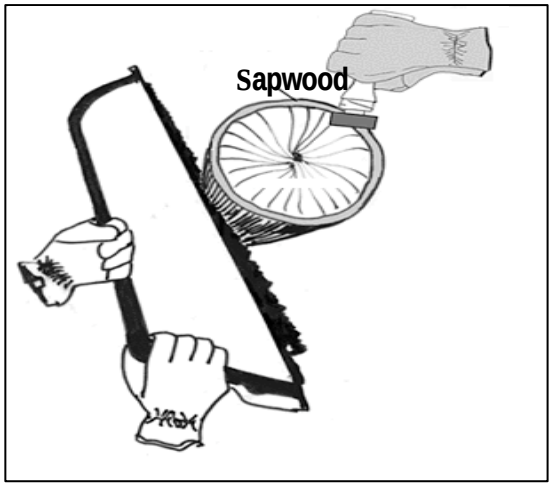

Figure 5: Cut and paint herbicide application technique. For maximum effectiveness, herbicide must be applied to the sapwood within 10 seconds of the cut being made.

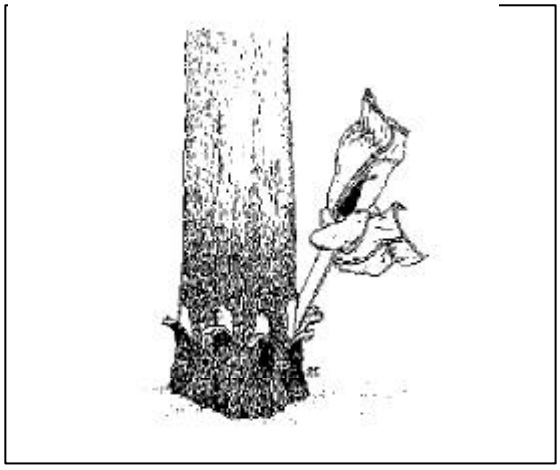

Figure 6: Frilling method of herbicide application. For maximum effectiveness, herbicide must be applied to the sapwood within 10 seconds of the cut being made.

Figure 7: Drill and poison herbicide application technique. For maximum effectiveness, herbicide must be applied to the sapwood within 10 seconds of the hole being made.

Garlon 600® (ai = triclopyr) is a commonly used selective herbicide. Triclopyr is considered slightly toxic to birds and low in toxicity to fish and invertebrates. It is moderately toxic to mammals.[8] Triclopyr breaks down fairly readily in soil and water. **This herbicide should not be used in aquatic areas. It can be used on woody weeds in commonly inundated areas when inundation within 6 months is of low likelihood – prior to summer for example.**

Grazon® (ai = picloram and triclopyr) and **Tordon**® (ai = picloram) are commonly used selective herbicides. Picloram is moderately to slightly toxic to fish and slightly toxic to invertebrates. It is almost non-toxic to birds and of low toxicity to mammals.[9] It is moderately to highly persistent in the soil. Persistence in the soil may inhibit re-vegetation of sprayed areas, sometimes up to twelve months. **Picloram-based herbicides should not be used in aquatic areas or areas subject to annual inundation**.[9] **Picloram is residual and readily dissolved in/mobilised by water. It will contaminate surface and ground water.**

Brush-Off® (ai = metsulfuron-methyl) is a commonly used selective herbicide. It has very low toxicity to birds, mammals, aquatic organisms and bees.[10] Metsulfuron-methyl has been known to persist in certain soils and impact on re-cropping.[11] **This herbicide should not be used in aquatic areas. It can be used in commonly inundated areas when inundation within 6 months is of low likelihood – prior to summer for example.**

MCPA® (ai = methyl-chlorophenoxyacetic acid) is a commonly used herbicide. MCPA is moderately toxic to birds; slightly toxic to mammals and freshwater fish; practically non-toxic to freshwater invertebrates or estuarine and marine organisms; and non-toxic to bees. MCPA is rapidly broken down by soil and water based micro-organisms. It takes longer if micro-organism presence is low.[12&13] **MCPA should not be used in aquatic areas or (due to its toxicity to birds) in areas subject to annual inundation (waterfowl habitat).**

Figures 4-7 sourced from:

- National Trust of Australia (NSW). (1999). *The National Trust Bush Regenerator's Handbook.*
- Glazik, R. (nd). *Fact Sheet for Herbicide Control Techniques in Bushland Areas.* Bushcare Tasmania.
- Muyt, A. (2001). *Bush Invaders of South-East Australia.* R.G and F.J. Richardson, Victoria.

Table 1. Weed Control in Aquatic and Riparian Areas

Uses described in this table are either covered by the respective product label or Off-label Permit No. 2652 issued by the National Registration Authority for Agricultural and Veterinary Chemicals.

Area	Weed	Permitted Herbicide	Recommended Herbicide Control Technique*	Non-chemical Alternatives
Aquatic Sites (Channel or wetland areas with surface water) For example, where cumbungi is growing within the waterway and herbicide use is judged to be the most suitable control technique. ***and*** **Commonly Inundated Sites** (Other channels, floodways, dry billabongs and backwaters, commonly flooded floodplains. Flooded at least once a year.)	Blackberry (*Rubus fruticosus*)	Roundup Biactive® or Weedmaster 360® (Garlon 600® on commonly inundated sites- not aquatic sites) **Don't add surfactants!**	Frill or axe stems and paint with undiluted herbicide. Cut and paint large stems. On commonly inundated sites, foliar spray with Triclopyr e.g. Garlon 600® if inundation within 6 months is of low likelihood – prior to summer for example.	Hand removal (small infestations). Controlled grazing (goats or sheep only) can be effective. Bio-control (a rust with limited impact).
	Crack Willow (*Salix fragilis*)	Roundup Biactive® or Weedmaster 360® **Don't add surfactants!**	Cut and paint. Drill or stem injection. Frill or axe stems and paint. Foliar spray (only spray to a height of 2m).	Large trees can be killed by a hot fire around trunk base.
	Cumbungi (*Typha spp*)	Roundup Biactive® or Weedmaster 360® **Don't add surfactants!**	Foliar spray.	Hand removal (small plants). Excavation (with roots/rhizomes). Cultivation (expose roots/rhizomes to frosts). Cut into soil surface regularly (to cut rhizomes). Drowning by cutting stems and leaves below water surface.
	Glyceria (syn. Poa aquatica or reed sweet grass). (*Glyceria maxima*) NB Take extreme caution not to spread *Glyceria* seed through soil transport (e.g. on machinery)	Roundup Biactive® or Weedmaster 360® **Don't add surfactants!**	Foliar spray (combine with dense local native species re-vegetation 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).
	Gorse (*Ulex europaeus*)	Roundup Biactive® or Weedmaster 360® (Garlon 600® on commonly inundated sites- not aquatic sites) **Don't add surfactants!**	Cut and paint with Roundup Biactive® or Weedmaster 360® On commonly inundated sites, if cut and paint is not practical, foliar spray with Triclopyr e.g. Garlon 600® if inundation within 6 months is of low likelihood – prior to summer.	Mulching combined with follow-up grazing and re-vegetation on mulched sites. Bio-control (e.g gorse mite) where other techniques are not suitable.
	Hawthorn (*Crataegus monogyna*)	Roundup Biactive® or Weedmaster 360® **Don't add surfactants!**	Cut and paint. Drill or stem injection. Axe or frill and paint. Foliar spray (only spray to a height of 2m).	Hand removal. Controlled grazing can assist in limiting regrowth and thicket density.
	Sycamore (*Acer pseudoplatanus*)	Roundup Biactive® or Weedmaster 360® **Don't add surfactants!**	Stem injection. Cut and paint. Frill and poison.	Hand removal.

Area	Weed	Permitted Herbicide	Recommended Herbicide Control Technique*	Non-chemical Alternatives
Occasionally or Rarely Inundated Sites (Riverbanks/flood-plains where only occasional floods are experienced. For example less than once a year.)	Blackberry (*Rubus fruticosus*)	Brush-Off® Garlon 600® (Grazon DS® or Tordon Timber Control Herbicide® or Tordon Double Strength Herbicide®)**	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).
	English Broom (*Cytisus scoparius*) Montpellier Broom (*Genista monspessulana*)	Roundup Biactive® or Weedmaster 360® Brush- Off® Garlon 600® Grazon DS®**	Cut and paint. Foliar spray, preferably Garlon 600®.	Hand removal. Mechanical removal (e.g. rip or bulldoze).
	Gorse (*Ulex europaeus*)	Roundup Biactive® or Weedmaster 360® Garlon 600® (Grazon DS® or Tordon Timber Control Herbicide® or Tordon Double Strength Herbicide®)**	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.
	Hawthorn (*Crataegus monogyna*)	Roundup Biactive® or Weedmaster 360® Garlon 600® Grazon DS® **	Cut and paint, stem injection. Foliar spray (only if under 2m in height).	Mulching/bulldozing/ slashing combined with follow-up grazing and revegetate on mulched sites.
	Ragwort (*Senecio jacobaea*) Thistles (eg *Cirsium arvense*)	MCPA Brush-Off®	Foliar spray (combine with dense re-vegetation of local native species for long-term results through shading).	Hand removal. Controlled grazing (sheep). Ploughing. (Combine with dense re-vegetation of local native plants for long-term results through shading.)
	Sycamore (*Acer pseudoplatanus*)	Roundup Biactive® or Weedmaster 360®	Stem injection, cut and paint (plus foliar spray for young plants).	Hand removal. Bulldoze and revegetate. Plough-in small plants.

* This section is not intended ϕ provide a comprehensive approach to managing these species and assumes non-herbicide alternatives have already been considered/attempted.

** Extensive use of picloram products is not recommended as it leaves residue in soils for considerable periods. Residue may contaminate waterways and affect revegetation efforts.

References

1 Land & Water Resources Research & Development Corporation (1996) *Guidelines for the Management of Riparian Lands Fact Sheet 1: Managing Riparian Lands.* LWRRDC, Canberra.

2 *Controlling gorse and hawthorn in riparian zones* (nd) Daniel Sprod (Ecosynthesis).

3 Tasmanian Rural Industry Training Board (2000). *National Farm Chemical User Training Program User Workbook.* Tasmanian Rural Industry Training Board, Tas.

4 Munn M.D. and Gilliom R.J. (2001). *Pesticide Toxicity Index for Freshwater Aquatic Organisms.* US Geological Survey, California.

5 United States Department of Agriculture, Forest Service (1995) *Atrazine Pesticide Fact Sheet.* http://infoventures.com/e-hlth/pesticide/atrazine.html. World Wide Web.

6 Texas Agricultural Extension Service, The Texas A&M University System (*1997*). *Pesticide Properties That Affect Water Quality.* http://entowww.tamu.edu/extension/bulletins/b-6050.html. World Wide Web.

7 United States Department of Agriculture, Forest Service (1995) *Glyphosate Pesticide Fact Sheet.* http://infoventures.com/e-hlth/pesticide/glyphos.html World Wide Web.

8 United States Department of Agriculture, Forest Service (1995) *Triclopyr Pesticide Fact Sheet.* http://infoventures.com/e-hlth/pesticide/triclopy.html World Wide Web.

9 United States Department of Agriculture, Forest Service (1995) *Picloram Pesticide Fact Sheet.* http://infoventures.com/e-hlth/pesticide/picloram.html World Wide Web.

10 United States Department of Agriculture, Forest Service (1995) *Metulfuron methyl Pesticide Fact Sheet.* http://infoventures.com/e-hlth/pesticide/metulf.html World Wide Web.

11 Noy, D.M. and Holloway, K.L. (2001). *Metsulfuron-methyl residues and potential recropping damage in Victorian cropping soils.* The Regional Institute Ltd, WWW.

12 Oregon State University (1996). *EXTONET MCPA Pesticide Information Profile.* http://ace.orst.edu/cgi-bin/mfs/01/pips/MCPA.htm

13 Louisiana State University AgCenter (2002). *Louisiana Suggested Chemical Weed Control Guide.* http://www.agctr.lsu.edu/Subjects/guides/weedguide/01weeds.htm. World Wide Web.