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Natural Heritage Trust

Water notes

Water notes for rivers management

GOVERNMENT OF WESTERN AUSTRALIA

ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION

Herbicide use in Wetlands

The majority of the wetlands and river systems of the southwest have become degraded, suffering from the loss of native vegetation, weed infestation and erosion. Restoration of these systems has become an important focus for many community groups and government agencies. Weed control is an extremely important part of the rehabilitation process, and is commonly the largest component of a project. Herbicide is often used to efficiently control wetland weeds, however there is widespread community concern over the effects of these synthetic chemicals on native fauna and flora. The risks of herbicide use need to be balanced against the benefits to the wetland system. For example, erosion of banks overgrown with exotic weeds will continue to destroy in-stream habitat for invertebrates, and many frogs are unable to use grassy areas as habitat.

Choice of Weed Removal Techniques

There are a number of alternative methods for weed removal, and if these are a realistic option, they should be used in preference to herbicides. Hand removal is suitable for many annual weed species, and for relatively small infestations. Plants need light and air, and smothering using black plastic or jute matting is another option, as is drowning of emergent species such as Bulrush by cutting the species beneath the water level in winter. Slashing of annual species before seed set will also eventually deplete the soil seed store.

Herbicide treatment of weeds should be used as part of an integrated weed management approach. The following methods may successfully deal with a number of weed species, but there may also be species that are best controlled with the use of herbicide. These usually include rhizomatous species such as Kikuyu, Couch and Nutgrass. It may also be better to spray large infestations of difficult to remove weeds such as Blackberry and Arum Lily, and to stem inject or paint the cut stems of large woody weeds such as Japanese Pepper. Initial treatment with herbicide may be supplemented with other methods such as hand removal in the follow-up treatment.

Herbicide may also be useful to kill weeds in high erosion sites along banks, leaving the root mass intact to help hold the bank together. Spraying weeds and leaving the root mass in the ground also minimises soil disturbance and provides less opportunity for further weed germination (Scheltema & Harris 1995; Hussey & Wallace 1992).

Frogs and Herbicide Use

There has been no comprehensive testing of most commonly used herbicides on aquatic fauna, and little research on their effects on West Australian ecosystems. Mandatory testing is carried out by chemical companies, but tests are under laboratory conditions, and testing is on a very small range of species. Frogs have been found to be very sensitive to some herbicide products, and in particular to the surfactants, or wetting agents used to improve the effectiveness of the chemicals (Bidwell & Gorrie 1995). Two herbicides have been tested to a limited extent in local conditions, and have been found to be safe for fauna and flora if used according to directions. These herbicides, Roundup Biactive® and Fusilade®, are also of low toxicity to humans, and biodegrade quickly upon entering a natural system (Mann 1998; Woodcock et al 1993; PMEP 1999). Roundup Biactive® has a wetting agent which is 100 times safer for frogs than the original Roundup formulation (Mann 1998).

To increase the safety factor, the life cycles of frogs in the wetland system need to be known. If possible, avoid spraying during the period from egg lay to dispersal of juvenile frogs into the surrounding area. This period varies according to species, but is generally between late autumn and early spring each year. Adult mature frogs are far less susceptible to chemicals than the thin-skinned juveniles. Colonisation will occur from nearby areas after treatment, and consideration should be given to leaving some areas unsprayed to allow this to happen easily (WA Museum 1999, Alcoa Frogwatch).

Minimising the Risks of Herbicide Use

It is important that herbicide use is as effective as possible, reducing the volume of herbicide used and the number of applications required. The following principles are designed to reduce the risks of herbicide use through minimising the amount applied, maximising the death of weed populations, and careful timing of herbicide application.

- Apply herbicide according to the recommended rate.
- If possible, try to spray when surface water levels are low, generally in early winter after germination has occurred, but stream levels have not risen appreciably.
- Ensure that weeds are sprayed at the correct time, usually when they are growing strongly, and before seed set.
- Minimise damage to frogs by determining the species present, and ensuring that as far as possible herbicide is not applied during egg laying, tadpole development or at the point where the juvenile frogs emerge from the water.
- Mix in a coloured dye so that you can accurately see which areas have been sprayed, and whether areas have been missed.
- Ensure adequate follow-up of weed treatment, so that repeat treatment is minimised.
- Where possible, wipe or inject weeds with herbicide instead of spraying, to avoid spray drift.
- Do not spray if plants are under stress, such as on very hot days or in very dry or dusty conditions, as uptake of herbicide through leaves will be minimal.
- Do not spray on windy days, or if it is likely to rain soon after application; before the herbicide has been adequately absorbed through the leaf surface.
- Avoid using surfactants, as many of these are more toxic to wetland fauna than the actual herbicide.
- If contractors are to be used for herbicide application, ensure they are familiar with the above principles (Scheltema & Harris 1995; Hussey & Wallace 1992; Pierce 1999).

It is also extremely important for the safety of the operator that all proper precautions are followed when using herbicides, including the use of correct clothing and disposal procedures. These instructions are listed on the chemical containers.

Common Herbicides

The following herbicides are recommended for use by community groups if used with care and according to instructions

Glyphosate (Roundup Biactive®, Roundup®, Rodeo®, Davison Glyphosate 450®)

Glyphosate is a broad spectrum, non-selective systemic herbicide that will kill most plants, including native species. It is poorly absorbed along the digestive tract and does not bioaccumulate. It is has a low toxicity to bees, fish and other aquatic organisms (Brain and O'Connor 1988; Klemm et al 1993; PMEP 1999).

Some of the surfactants used in agricultural formulations have been found to be significantly more toxic to fish, amphibians and aquatic invertebrates than the herbicide itself (Bidwell and Gorrie 1995; Klemm et al 1993; PMEP 1999). Newly developed formulations such as Roundup Biactive®, which contains a substantially less toxic surfactant and was designed for use in aquatic habitats is the recommended option (Mann 1998).

Glyphosate is strongly adsorbed and inactivated by soil and by organic and mineral suspended particles in water bodies, so leaching and contamination of runoff is negligible (PMEP 1999). There is no residual weed control, and an area can be seeded or replanted soon after application. Perennial weeds should be left undisturbed for 3 – 7 days to allow movement of herbicide to all parts of the plant.

It is used for control of a large variety of weeds, generally where there are no native plant species present.

Fluazifop-p-butyl (Fusilade®)

Fluazifop-p-butyl is a selective herbicide, which is designed to kill grasses (members of the Poaceae family), and is safe to use on most other plant species, including rushes and sedges. It has a low toxicity to bees and rats and is practically non-toxic to ducks and mammals (PMEP 1999). It also has a low toxicity to fish and aquatic organisms (Brain and O'Connor 1988).

Fusilade® has been tested in Western Australia and was found to be highly effective in removing introduced grasses, while having no detectable impact on aquatic invertebrates (Woodcock et al 1993).

It is rapidly absorbed by plants and is rainfast within 1 hour. The plants begin to wilt 1- 2 weeks after application, and may take up to 5 weeks to completely die. Spraying should occur before flowering (Crop Care Australasia Pty Ltd 1997).

Fusilade® is only slightly soluble in water, and is rapidly degraded, with a half-life of one week in moist soils (Moore and Fletcher, n.d.). It is commonly used for control of Veldt Grass, Kikuyu, Couch and Water Couch where native plant species are present.

The following herbicides are recommended for use by professionals only

Metsulfuron-methyl (Brushoff, Ally, Groper and Escort)

Metsulfuron-methyl is a selective herbicide used on broad leaf weeds and some grasses, and can kill native species. It is a systemic herbicide which is broken down in to harmless by-products (PMEP 1999).

It is excreted from the body within hours and has a low toxicity to fish, a low toxicity to mammals and birds and a very low toxicity to aquatic microorganisms and terrestrial invertebrates (Klemm et al 1993; Moore and Fletcher, n.d.; PMEP 1999).

This herbicide has a half-life of 1 – 4 weeks in soil and 0 – 1 week in water (Klemm et al 1993), however Moore and Fletcher, (n.d.) have reported a residual activity of up to 2 years where it has been applied directly to the soil. It is commonly used for control of Cape Tulip, Patterson's Curse and Blackberry.

Chlorsulfuron (Glean®, Siege®, Tackle®)

Glean is a selective herbicide which is absorbed by the foliage and roots (Klemm et al 1993) and is used to control most broadleaf weeds and some grasses (PMEP 1999).

It has a low toxicity to birds, mammals, fish and aquatic invertebrates (Brain and O'Connor 1988; PMEP 1999).

This herbicide is not readily adsorbed to soil or organic matter (PMEP 1999), and may be prone to leaching. It is degraded by soil microbes, however it may persist in the soil for some time, having a half-life of 4 – 20 weeks in soil and 1 – 2 weeks in water (Klemm et al 1993; Moore and Fletcher, n.d.).

Death of plants may be slow (PMEP 1999). It is commonly used for Cape Tulip, Patterson's Curse and Arum Lily

Diquat (Aquacide®/Reglone®)

Diquat is a contact herbicide used for weed and grass control, and is registered for the control of floating, submerged and emergent aquatic weeds (Klemm et al 1993; PMEP 1999).

This herbicide has a low toxicity to bees and micro-organisms, a low to moderate toxicity to fish and aquatic organisms, and a low to high toxicity to birds (Brain and O'Connor 1988; Klemm et al 1993).

However, it should be noted that the rapid death of plants following the application of diaquat may deoxygenate the water and this may lead to death of fish and other aquatic species. Therefore, it is recommended that large areas should not be treated in a single application, especially where the weed growth is dense. Fish have died in Western Australia where this product has not been used carefully.

The product is rapidly absorbed by leaves, and is not affected by rain shortly after application (Crop Care Australasia 1999).

West Australian studies have shown that spraying Diquat on the leaf surface of Hydrocotyle mats reduced the weed cover by 80 – 90%, but the effectiveness decreased rapidly, and considerable recovery was observed on all treatments after 30 days. This study recommended the use of a systemic herbicide in preference to Diquat, as only the exposed portions of the plant were killed and the resulting regeneration necessitated further treatment (Pierce & Raynor 1992).

Although Diquat is persistent in the environment, it is rapidly and strongly inactivated in the soil, and becomes biologically unavailable. It is therefore unlikely to cause contaminated leachate or runoff (Klemm et al 1993; PMEP 1999). When used in aquatic systems, Diquat is rapidly dissipated via sorption with aquatic sediments, organic material and absorption by plants (Klemm et al 1993). In natural waters, it breaks down within 8 to 27 days (Klemm et al 1993).

It is commonly used for floating and submergent aquatic weeds, such as Water Hyacinth and Hydrocotyle.

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