Water and Rivers Commission | WN25 January 2002

Natural Heritage Trust

Water notes

Water notes for rivers management

ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION

The effects and management of deciduous trees on waterways

Deciduous trees have been widely planted in many parts of Australia, both as river bank stabilisers and for their attractive 'European' appearance. Unfortunately, deciduous trees are not suited to the Australian environment in many ways. In the Eastern States, willows in particular have become aggressive weeds spreading along streamlines. They can cause blockage of rivers and streams, excessive eutrophication and displacement of native flora and fauna. An extensive campaign is now underway in the Eastern States to control the problem.

Deciduous trees in Western Australia

In Western Australia, a wide variety of deciduous trees have been planted, mainly for aesthetic reasons. Commonly planted trees include the following:

Common name	Scientific name
*Tree of Heaven	*Ailanthus altissima*
*Kurrajong	*Brachychiton populneus*
Coral Tree	*Erythrina speciosa*
Jacaranda	*Jacaranda mimosifolia*
*Cape Lilac	*Melia azedarach*
Plane Tree	*Platanus orientalis*
*White Poplar	*Populus alba*
*Lombardy Poplar	*Populus nigra var. italica*
Oak Tree	*Quercus spp.*
*Willows	*Salix spp.*

*Known to spread in natural areas through seed or vegetative means.

None of these trees have become a major weed in WA. However, they have the potential to become a greater problem in the future. Willow trees in the Eastern States that were previously thought to spread only from broken branches are now spreading through seedlings as well. Hybrid species are common, and are often much more vigorous than the parent species (Cremer 1999).

The threat to water quality is much greater and more immediate. There is an increasing trend for landscapers of new housing estates to plant deciduous trees throughout the subdivision, leading to a large increase in organic matter entering drainage systems and waterways in late autumn/early winter.

Weeping Willows along the Brunswick River. *B. Hughes*

Nutrient enrichment and organic leaching

Deciduous trees drop all their leaves over a short period at the end of autumn, unlike Eucalypts, which tend to lose their leaves all year, though more so in the summer. The leaves of deciduous trees are also 'soft' and decompose very readily, far more quickly than our aquatic macro-fauna can process. The large load of organic material, coupled with rapid breakdown by microbes, results in an excessive release of nutrients into water systems, causing deterioration in water quality (Carter 1993). Even deciduous trees planted a long way from the nearest waterbody can deliver large amounts of organic matter via

artificial or modified drainage systems. Figure 1 shows some of the deleterious effects deciduous trees have on waterways.

Effects on flora and fauna

Many deciduous trees cast a dense shade in spring and summer, which restricts or prohibits the growth of many of the native flora. The subsequent lack of suitable habitat may result in a greatly reduced diversity of native flora and fauna. Monitoring in South Australia has shown that native fish and many invertebrates such as beetles, dragonflies and daphnia are greatly reduced in numbers beneath willow trees. The dense bark of willows prevents insects from using the tree for habitat, and subsequently reduces the numbers of insect-eating birds. Woody debris from deciduous trees often decays quickly, without producing the long-term shelter for aquatic life provided by branches from Eucalypts (Mt Lofty Ranges Catchment Program, Waterwise No 2). The dense shading may also reduce water temperature below normal levels in some situations. In addition, the fall of leaves in autumn removes any protective habitat within the tree itself over the winter.

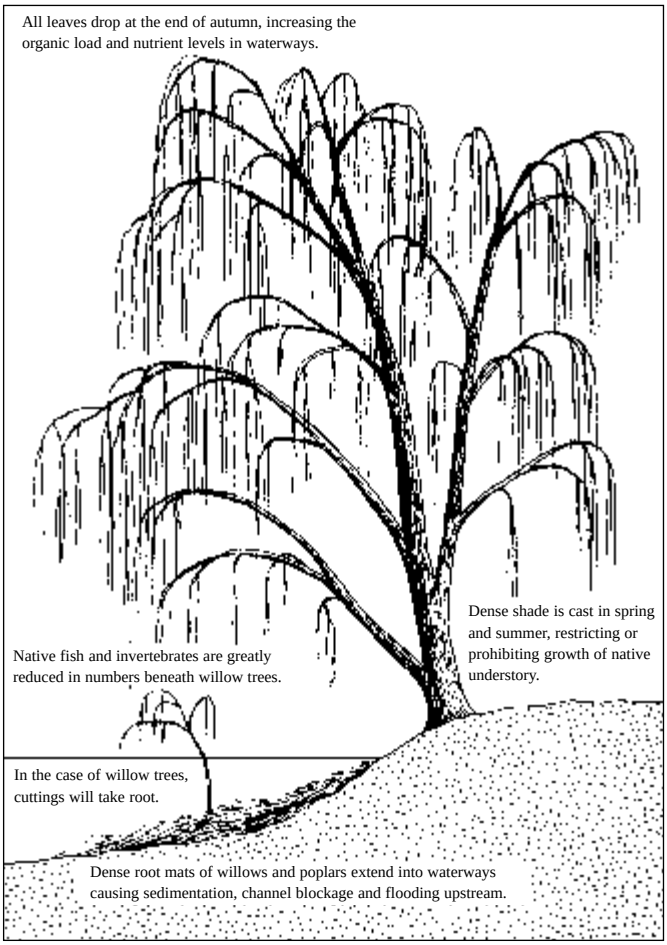

Figure 1. The effects of deciduous trees on waterways. [Modified from: Mount Lofty Ranges Catchment Program and Water Resource Group, Department of Environment and Natural Resources.]

Effects on erosion, sedimentation and flooding

The intense shading caused by many deciduous trees can prevent other flora from growing beneath them. The resulting lack of understorey vegetation can render the banks of waterways prone to erosion. By contrast, in other situations willows may form dense mats of roots that extend out into streams and rivers, causing increased sedimentation. In severe cases this can cause a channel blockage and result in flooding upstream. Trees such as willows are also easily uprooted in floods, causing major blockages (Mt Lofty Ranges Catchment Program, Waterwise No 2).

Management of deciduous trees

In order to carry out effective stream restoration it is often necessary to remove deciduous trees. Several methods are used in the Eastern States, where large-scale removal has been going on for some years. These methods are described below (Cremer 1999).

• *Mechanical removal*

The seedlings of many trees can be removed by hand pulling. This is often required to prevent re-invasion after the large trees have been removed or controlled by herbicides.

The use of large machinery to remove deciduous trees can result in damage to other flora and to the banks and floodplains of streams and rivers, and should be considered carefully. Mechanical removal is best for the smaller willows such as Chilean Willows, which are shallow-rooted and can be completely pulled out using a vehicle and chain. Care must be taken however to ensure that all broken branches are removed from the site before they take root and resprout.

Chilean Willows have spread along Bennett Brook in Caversham. *L. Taman*

• *Cut stump*

Trees may be felled with a chainsaw and the stump painted with 1 part of glyphosate (360 g/L formulation)[1] mixed with 2 parts water. This should be carried out in spring or summer, while the tree is actively growing. It is vital that the stump is painted within minutes of felling the main trunk and crown, as the exposed timber rapidly seals, preventing penetration of the chemical. If the tree is growing in waterlogged soils, obtaining penetration may be difficult, as the hydrostatic pressure can cause the stump to 'weep' for a prolonged period. Following treatment, suckering may still occur from the base, and follow-up treatment may be necessary. Once again, check that all fallen branches are cleared from the site.

• *Stem injection*

This is the preferred method for removal of deciduous trees. Again, stem injection is best applied while the tree is actively growing in spring or early summer. This method can be very effective if carried out correctly. Cuts are made with an axe or holes drilled using a hand drill at regular intervals around the trunk. The injection points need to be at the right depth so that they penetrate well into the living sapwood (Figure 2). Lateral travel of the herbicide through the sapwood is only 2-3cm, so it is vital that injection points are not spaced more than 5cm apart. If they are spaced at a greater distance, strips of sapwood will remain alive to support the growth of the crown. However, it is also important not to cut through all the sapwood around the trunk, or the chemical will not be transferred down to the roots.

The holes should be injected with undiluted glyphosate (360 g/L formulation), and the injection must take place immediately the holes are created (as the axe is levering the cut open, or as the drill is withdrawn) to be effective. The tree may take 3-4 months to die. It can then be left in place as habitat, or felled and removed.

• *Basal bark treatment*

For trees with stems up to 10-15cm diameter, paint or spray the bark from ground level to 30cm with a mixture of 20ml Access® in 1 litre of diesel. Treat all stems on multi stem species. Best results usually occur in early summer or autumn when the trees are actively growing. This is quicker than the stem injection or cut stump methods. In large infestations, it is often more efficient to use basal bark treatment for all the trees and then return in 12 months and use the cut stump method on the survivors.

Angle and depth of cut for herbicide placement

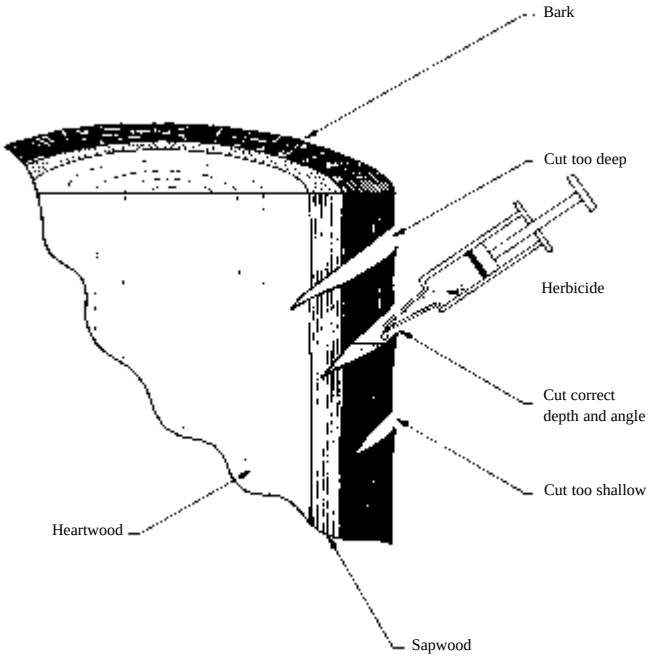

Figure 2. Management of deciduous trees – stem injection. [Modified from: Department of Water Resources, NSW.]

Before undertaking a deciduous tree removal program, several factors need to be taken into consideration:

• *Community consultation*

Deciduous trees are often held in high regard by the community because of their aesthetic appeal or historical association. It is wise to inform people why removal may be necessary.

• *Erosion potential*

If trees are near the banks of waterbodies, there may be an increased erosion risk if the trees are mechanically removed. In this case, it is best to leave the dead stump and plant native species around it.

• *Rehabilitation*

The trees may have provided a degraded habitat, but it was some habitat. In addition, the reduction in shading may encourage other weeds to flourish. It is essential to plan a follow-up rehabilitation program, where native species are not already present to take over the former habitat of the deciduous trees.

[1] Use a formulation of glyphosate that is registered for use in aquatic situations.

References and further reading

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