

# *UPPER PARRAMATTA RIVER CATCHMENT*



## *WILLOW MANAGEMENT STRATEGY*



June 2003

## Executive Summary

Willows, or Salix species, are now recognised as a major environmental problem in Australian creeks and rivers.

The problems created by willows in the Upper Parramatta River catchment are:

- Increased potential for flooding through channel obstructions
- Streambank erosion (eg Greystanes Creek, Darling Mills Creek at Speers Road)
- Major impacts on channel form and sedimentation
- A major contributor to the loss of native riparian vegetation

This document outlines a comprehensive process to implement a long-term program of willow control in the Upper Parramatta River catchment.

The strategy outlines a process to identify the scale of the willow problem in the Upper Parramatta River catchment, prioritise a program of works based on a clear set of willow control guidelines, and allocate seed funding to initiate a long term willow control strategy in the Upper Parramatta River Catchment.

The key options recommended are:

- a community willow mapping project as a basis for promoting awareness of the problem of willows in the Upper Parramatta River catchment, and expanding base data on the extent and location of willows.
- A method of prioritising willow control works across the catchment.
- Guidelines for willow control applicable to the Upper Parramatta River catchment.

The Strategy identifies willows as a major environmental issue in the Upper Parramatta River Catchment.

## *1. Objectives of this report:*

- 1.1. Establish guidelines for the removal of willows in the Upper Parramatta River catchment.
- 1.2. To provide a process to develop a prioritised willow eradication program for the Upper Parramatta River catchment.

## *2. Willows - Background*

For much of Australia's early colonial history, a great deal of effort was made to make the newly arrived settlers of Europe feel at home in the sometimes hostile Australian landscape.

Plant acclimatisation societies and others endeavoured to bring species common in European landscapes out to Australia to recreate the feel of "home". One of the most successful translocations of plants in this regard was the "Weeping Willow", whose gently drooping branches reminded people of English streams. In the 20<sup>th</sup> century the planting of willows expanded with government agencies and others promoting the planting of willows, with their very vigorous root systems, to prevent creek erosion in the degrading Australian landscape.

In the last decade, the wheel has turned full circle. The willow is now proven to be a major threat to natural river processes and native riparian plant communities. Of particular concern is the fact that, until recently, willows were viewed as being sterile and incapable of producing offspring from seed. This limited their capacity to spread. Recent evidence shows that willows are now producing fertile seed and this is causing major concern throughout NSW. CSIRO research estimates that in the Bega River of NSW some two million seedlings became established from seed germinating in 1993.

In response to the increasing evidence that the willow is causing environmental damage, most willow species have been declared noxious across the state of NSW.

Problems associated with willows in Australian creeks and rivers are:

- Willows in creeklines tend to grow in a multi-stemmed form and obstruct and divert floods, forcing water flow onto sometimes highly erodible creekbanks.
- Small broken branches buried in sediment will start another tree and spread the infestation.
- They displace native vegetation.
- They consume a great deal of water which can stress small creeks in long dry spells.
- They disrupt nutrient cycling, in stream food webs and associated native fauna.
- Some species of willow now produced massive volumes of fertile seed.
- They are often brittle and affected by borers and rot. This makes them prone to falling into creeks, spreading infestations and diverting streamflow.

### **3. Are Willows a problem in the Upper Parramatta River catchment?**

Yes!

In areas of Toongabbie Creek, Lower Darling Mills Creek and the fringes of the Upper Parramatta River upstream of Charles Street weir, willows are a major problem causing significant bank erosion, sedimentation of channels, loss of native vegetation and channel obstructions. Each of the four council areas in the catchment has a number of notable willow problem areas. The Upper Parramatta River catchment is already significantly affected by flooding. Willows are a contributor to an increased risk of flooding in the catchment.

The Green Corridors Vegetation Management Strategy for the Upper Parramatta River catchment identifies the loss of riparian vegetation as a major issue. The spread of willows and changes to ecosystems resulting from the presence of willows are identified as a high priority for action.

The main problem willow species in the Upper Parramatta River catchment is *Salix babylonica*, or the weeping willow. In 1999, all *Salix* species, with the exception of *Salix babylonica*, *S. reichardtii* and *S. calodendron* were declared as a category W4g weed under the NSW Noxious Weeds Act (1993). This category of noxious declaration requires that “the weed must not be sold, propagated or knowingly distributed”.

Unfortunately, *Salix babylonica* has not yet been declared noxious across all of NSW, presumably for cultural reasons, but causes the same problems in the Upper Parramatta River catchment as other willows that have been declared noxious.

A willow control program for the Upper Parramatta River catchment must take consideration of the following issues:

- Heritage values of willows
- Maintenance of bank stability
- Replacement with suitable local native vegetation
- Habitat value, e.g. where hollows for nesting are present
- Possible impacts of debris on flooding
- Aesthetics of waterways
- Community awareness
- Regulatory issues
- Funding

These issues are addressed in the next section of this report.

## **4. Local issues of significance**

### **4.1. Heritage values**

The heritage value of some willow trees in the historic Parramatta area is important. However most willows in creeklines in the Upper Parramatta catchment are relatively young and unlikely to be of heritage significance. Willows on creeklines in the upper Parramatta River catchment quickly become affected by borers, decay of upper limbs and flood damage and rarely survive to old age.

In the highly urbanised Upper Parramatta River catchment, heritage willows away from streambanks are generally not a problem, although the risk of seed spread into surrounding creeks has recently been recognised by willow specialists from the Department of Land and Water Conservation (DLWC). The potential for this to be a problem in the Upper Parramatta River catchment is minimal if a long term willow management strategy is implemented.

### **4.2. Maintenance of bank stability**

The vigorous and deep spreading roots of the willow tree are effective in holding creek banks together. Problems arise when large, heavy and brittle willow limbs or rootballs fall into the stream, diverting channel flow and often catching enough sediment to allow other weeds to colonise, and for juvenile willows to grow from broken branches. What occurs is a monoculture of willows and changed channel forms. This is usually an undesirable outcome, particularly in the Upper Parramatta River catchment where streams often flow in narrow corridors of open space surrounded by developed areas. (See Figure 1a and 1 b)

### **4.3. Replacement with suitable local native vegetation**

A variety of native plant species quite readily survive in high flow areas on the edges of creeks (the riparian zone). Willows and other weeds become established after disturbance such as erosion, sedimentation, mechanical clearing, grazing, or death of natives through changed environmental conditions. Species recommended for use in willow replacement programs are listed in Appendix 2.

A new method of growing native seedlings called “longstem” tubestock also allows native seedlings to be planted much deeper into the soil profile. This achieves a far higher survival rate in floods and has been shown to achieve rapid growth rates in the Hunter River catchment. Longstem tubestock are ideal for willow replacement.

### **4.4. Possible impacts of debris on flooding**

One method of willow control involves poisoning the stem (refer 4.8, 4.9) and allowing the tree to die in-stream. This is the most cost effective technique, but in some situations carries the risk of debris being carried downstream in floods and blocking culverts and pipes. This must be taken into consideration when determining methods of killing adult willows.

Poisoned willows may also create public risks when located in areas where branches may fall on passers by. This must be considered when poisoning willows and leaving them on site for cost reasons.

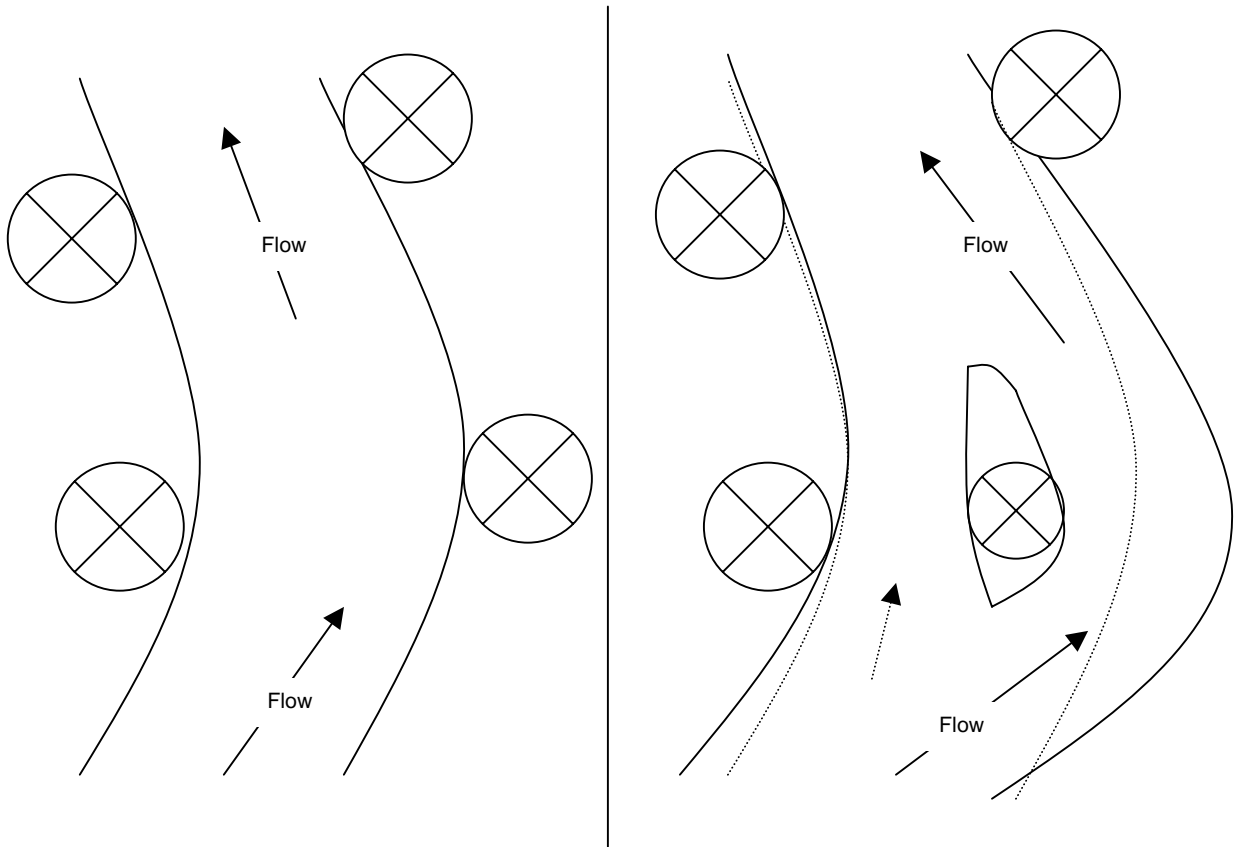


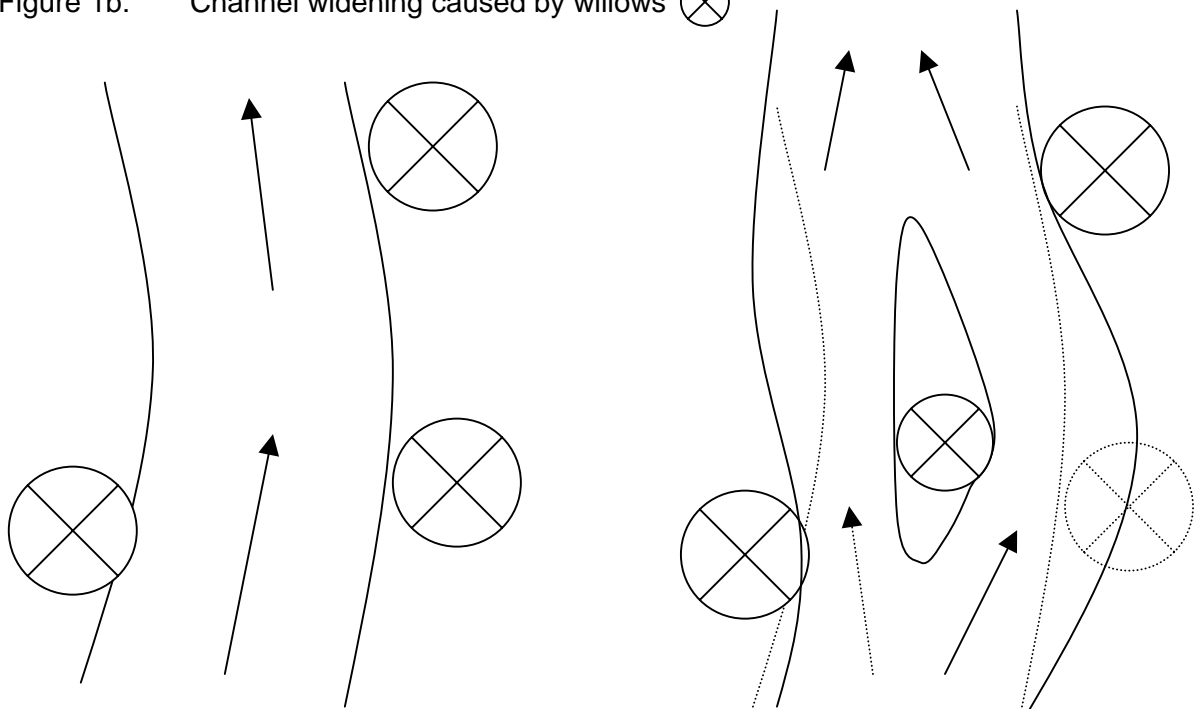


Figure 1a: Lateral migration caused by willows 

Willows establish or planted on upper creekbank

Willows establish mid-stream through branch fall or bank undercutting, forms mid-channel sediment plug resulting in changes to channel

Figure 1b: Channel widening caused by willows 



Willows establish/planted on straight section of stream

Willow limb fall into creek, creates sediment island

#### **4.5. Aesthetics of waterways**

To most observers, the willow is a beautiful tree and has a very marked visual influence on the landscape. A major problem with complete eradication programs is that it takes up to 3-5 years before a mature riverine forest appearance can be re-established. Any program of willow control in the Upper Parramatta River catchment should be implemented on a staged basis to prevent short term loss of amenity to nearby residents. This is not so important in areas adjoining industry along Toongabbie Creek, however for habitat protection, staged clearing is preferred.

#### **4.6. Community Awareness**

Willow control programs have proven to be a contentious issue in the community. There are several reasons for this:

Privacy – removal of large or thick willow growth can remove privacy of nearby residents as well as affecting views and other aesthetic features. The guidelines for willow removal address this issue by recommending a staged replacement process. It is essential that the affected community be informed of proposed removal programs and given an opportunity to input into the staging of removal and the site outcomes.

#### **4.7. Regulatory issues**

Willows and their removal are generally regulated under the following Acts of Parliament in NSW:

- Environment Planning and Assessment Act 1979
- Noxious Weeds Act 1993
- Rivers and Foreshores Improvement Act 1948
- Soil Conservation Act 1938
- Water Management Act 2000

The non-inclusion of *Salix babylonica*, under the Noxious Weeds Act (1993) declaration of willows as W4g weeds, requires that the council's regulatory framework for the control of weeping willows be addressed as part of any control program in the Upper Parramatta River catchment. Several options are available:

##### **4.7.1. Option 1 – Exemption under the Tree Preservation Order (Preferred Option)**

Local councils administer the Environmental Planning and Assessment Act (1979). Under the provisions of the EP&A Act councils are able to adopt a Tree Preservation Order (TPO) and establish a process by which trees are permitted to be removed. Exemptions can be made for willow removal under the Tree Preservation Order. Both Parramatta City and Baulkham Hills Shire Councils exempt willows under councils TPO. It is suggested that Blacktown City Council and Holroyd City Council achieve an appropriate exemption under the TPO by a resolution of each council that:

*“All willows within, or directly adjacent to, the bankful channel width of a creek or river may be removed without consent under the Tree Preservation Order subject to a consideration of aesthetic issues, erosion potential, and replanting of native species.*

“Willows with trunk width up to 1 metre in diameter may be removed from all land areas without consent under the Tree Preservation Order subject to a consideration of aesthetic issues, erosion potential, and replanting of native species.”

#### 4.7.2. Option 2 – Local Noxious Weed Declaration

Local councils may make a submission to the Minister for Agriculture, requesting that a species of plant be declared noxious under the provisions of the Noxious Weeds Act (1993) within a specified area of NSW. The main benefit of declaration of *Salix babylonica* as a W4g weed in the Upper Parramatta River catchment is the prohibition of sale or distribution of the target species. As the sale of willows in the UPRC is not the main form of distribution, (willows are locally spread primarily by fallen limbs and branches) the main benefits of this option would be to educate the community that willows are a significant problem in the UPRC.

Option 1 can achieve the objective of simplifying approvals for willow control programs. In the long term it would be desirable to include *Salix babylonica* as a W4g noxious weed under the noxious weeds act in all catchment councils.

#### 4.8. Funding

Funding allocated to willow control in the Upper Parramatta River catchment is minimal. Parramatta City Council has carried out targeted willow eradication along sections of Toongabbie Creek, including McCoy Park basin, in recent years. Other catchment councils include willow removal where other creek restoration projects are funded (eg Greystanes Creek).



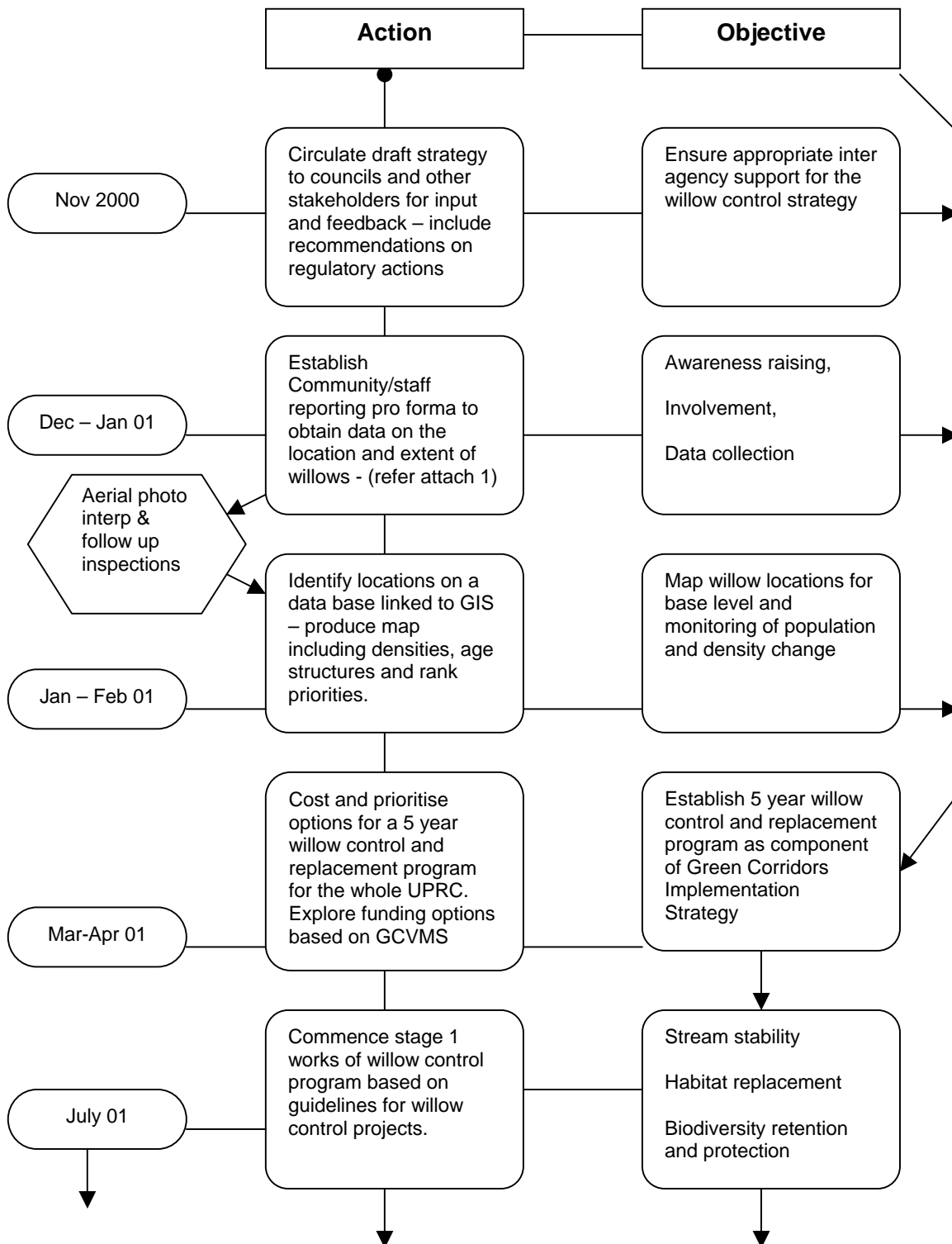
Typical decay of willow trunks, Greystanes Creek



Channel constrictions and sedimentation caused by willows, Speers Rd, Darling Mills Creek, Northmead.

## Willow Control Strategy Timeline – Upper Parramatta River Catchment

The flowing flow chart outlines the process to map, prioritise and devise a program of works to control willows in the Upper Parramatta River catchment.



**GIS:** Geographic Information System  
**UPRC :** Upper Parramatta River Catchment Trust  
**GCVMS** Green Corridors Vegetation Management Strategy

## **5. Willow Control Guidelines (adapted from NSW DLWC for UPRC)**

### **5.1. Guidelines for willow control and replacement**

The NSW Department of Land and Water Conservation (DLWC) has identified a number of best management principles for willow clearing adjoining prescribed streams. Creeks within the Upper Parramatta River catchment do not fall under the category of “Prescribed Streams”, however these principles provide a good basis for the formulation of a local willow control strategy. The following is an adapted version of these DLWC Best Practice Guidelines:

### **5.2. Adapted general principles**

5.2.1. Willow and willows means *Salix* species including hybrids, varieties or clones of *Salix* species.

5.2.2. Willow clearing will be undertaken in such a way as to minimise damage to other vegetation

5.2.3. Clearing of willows will only be undertaken using one or more of the following methods – hand removal, cut and paint stump (chainsaw or hand cut), foliar spraying or stem injection (to be an appropriately licenced herbicide when used in proximity to water)

5.2.4. The general clearing process will involve killing each willow (stem injection of Glyphosate), waiting to ensure complete death and, where necessary removal of the dead tree and/or replanting of the site.

5.2.5. Where replanting on creeklines is necessary, local provenance native riparian species should be used, unless heritage or other considerations dictate otherwise (eg. Parramatta Park).

### **5.3. Corridors**

5.3.1. Where native fauna species use willows as habitat for movement, caution should be exercised and staged removal considered.

### **5.4. Period in which to undertake clearing**

5.4.1. Willow clearing programs should be designed to be finished within 3 – 5 years from the date of commencement in a target sub catchment.

### **5.5. Debris management**

5.5.1. Debris should be removed from flood prone areas. In the case of the Upper Parramatta River catchment, a guideline of a minimum 50 metre distance from a potential blockage (eg. bridge culverts, pipes) shall be applied, although this will require assessment at each control point. Where willows are a reasonable distance upstream of blockages and are not at risk of falling on passers by, poisoning and leaving in situ can be considered subject to assessment of flood potential, liability risk and impacts of debris on geomorphological processes.

## **5.6. Herbicide use**

5.6.1. All use of herbicides in carrying out willow control must comply with the requirements listed on labels. Only herbicides registered for the particular application should be used (see 5.9.3).

5.6.2. The application of herbicides is best carried out during Spring to through to early Summer when the greatest success rates are achieved.

## **5.7. Hand removal**

5.7.1. Hand removal should only be used for willows with a total height of 1 metre or less.

## **5.8. Cut and paint stump method**

5.8.1. Cut and stump method involves cutting each aerial trunk off completely and applying the appropriate herbicide registered for this purpose, generally Glyphosate based. All living plant material must be removed and disposed of off site, or it will resprout in the channel sediments.

## **5.9. Foliar spraying**

5.9.1. This involves spraying the foliage of each willow with an herbicide registered for this purpose. Generally this method should be used only for trees below 1.5 metres in height to avoid spray drift to non target species.

5.9.2. Foliar spraying should only be undertaken when foliage is present on willows.

5.9.3. Foliar spraying should only be carried out by suitably trained persons. Roundup Biactive, or other similar licenced Glyphosate based products suitable for use near water should be used.

5.9.4. Where foliar spraying is used, the willows should be left in place until complete death of the plant.

## **5.10. Stem injection**

5.10.1. Stem injection involves making one or more drill holes or cuts around the aerial trunk below the lowest branch, followed by immediate injection of a large fluid volume of herbicide registered for the purpose. Glyphosate based herbicides will generally be appropriate. Holes and cuts must be angled downwards (generally between 30-45 deg) into the trunk to prevent herbicide escape.

5.10.2. The time taken for effective death of a stem injected willow will vary depending on season, weather and the location of the tree.

## **5.11. Removing willow trees**

5.11.1. Disturbance of the soil and vegetation must be minimised where disturbance will destabilise soils or creekbanks. Stumps may be removed where they are causing mid stream obstructions, providing an adequate assessment of erosion potential is carried out.

5.11.2. Glyphosate herbicide should be applied to any stumps or shoots immediately after cutting to reduce the opportunity of regrowth.

## 5.12. Revegetation

5.12.1. In most situations, appropriate local provenance native riparian species should be used to revegetate creekbanks as part of a bank stabilisation program.

## 6. Factors to be considered in prioritising the willow control program

Are identified willows contributing to one of more of the following problems?

- Instability of creekbanks causing erosion of channel changes
- Existence in upper areas of catchment where downstream propagation may occur
- Proliferation in sub-catchments where efficient and effective removal can be attained
- Accumulation of in-stream sediment
- Displacing or otherwise damaging native vegetation
- Further spread of willows to sensitive creek environments
- Public risk to infrastructure, private property or risk of personal injury

### Table to assist in prioritising willow control works

Problem	Description	Priority
Location	In-stream	High
	Base of toe	High
	Mid bank	Medium
	Top of bank	Medium
	More than 3 metres from top of bank	Low
Surrounding environment	Immediately upstream, or in, a riparian remnant or significant conservation reserve	High
	Within 50 metres of a riparian remnant or revegetation or regeneration site	Med
	Isolated fragment in an area not proposed for revegetation	Low
Geomorphological processes	Actively eroding bank or instream sedimentation	High
	Potential for erosion or sedimentation apparent but not yet advanced	Medium
	Streambank relatively "natural" in form, with wide buffer in the flood plain	Low
Proximity of potential flow obstructions	Pipes or narrow bridge culverts more than 200 metres away	High
	Pipes or narrow bridge culverts between 50 & 200 metres away	Medium
	Pipes or narrow bridge culverts within 50 – 100 metres downstream, depending on size of outlet	Low
Visual Impact of Removal	This category must be addressed in staging works based on the above priorities	Variable

## **7. Funding:**

External grant funding opportunities for willow control and replacement are limited.

The Upper Parramatta River Catchment Trust has allocated funding in the 2001/2002 and 2002/2003 financial years to assist councils on a \$ for \$ basis in willow control programs.

The scheduling of *Salix babylonica* as a W4g noxious weed under the Noxious Weeds Act 1993 will provide further opportunities for funding from the NSW Department of Agriculture.

## **8. Conclusion**

This document outlines a process to identify the scale of the willow problem in the Upper Parramatta River catchment, prioritise a program of works based on a clear set of willow control guidelines.

# WILLOW REPORTING FORM

## Upper Parramatta River Catchment

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Name \_\_\_\_\_

Contact details:

Address: \_\_\_\_\_

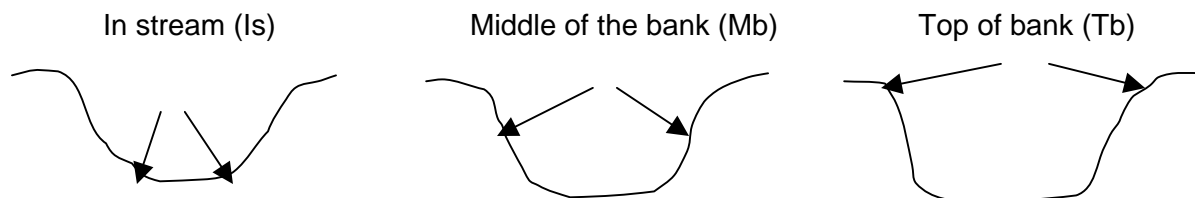
Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

e-mail: \_\_\_\_\_ Mobile: \_\_\_\_\_

Location of willow(s) (nearest street or reference point, UBD reference if possible):

\_\_\_\_\_

Location of willow(s) in channel (circle):



Number of willows per 50 metre length of creek: **R =** \_\_\_\_\_

Height categories (circle): (Large)                      (medium)                      (small)

Large (L) – main trunk greater than 60 centimetres in diameter, greater than 5 metres high

Medium (M) – main trunk diameter(s) between 15 cm and 60 cm dia, 1.5 – 5 metres high

Small (Sm) – less than 1.5 metres high

Other comments:

\_\_\_\_\_  
\_\_\_\_\_

## Appendix 2

Selection of native species suitable for willow replacement programs

### Sandstone and Sandstone/Shale Transition areas

Species	Common name	Comments
<i>Acacia decurrens</i>	Green Wattle	
<i>Acacia floribunda</i>	Gossamer wattle	Mid/upper
<i>Angophora floribunda</i>	Rough Bark Apple	Upper
<i>Backhousia myrtifolia</i>	Grey Myrtle	Mid/upper
<i>Callicoma serratifolia</i>	Black Wattle	Lower and upper bank
<i>Ceratopetalum apetalum</i>	Coachwood	Moist sites
<i>Ceratopetalum gummiferum</i>	Christmas bush	Moist sites upper
<i>Eleocharpus reticulatus</i>	Blue Berry Ash	Upper
<i>Eucalyptus saligna</i>	Blue Gum	Upper
<i>Eucalyptus tereticornis</i>	Forest Red Gum	Upper
<i>Eucalyptus resinifera</i>	Red mahogany	Upper
<i>Eucalyptus punctata</i>	Grey Gum	Upper
<i>Gahnia</i> sp	Saw Sedge	Low lying moist areas
<i>Glochidian ferdinandi</i>	Cheese Tree	Upper
<i>Lomandra longifolia</i>	Matt Rush	Toe
<i>Syncarpia glomulifera</i>	Turpentine	Upper
<i>Tristaniopsis laurina</i>	Water gum	Lower/upper

### Shale and low lying undulating terrain

Species	Common Name	Comments
<i>Eucalyptus saligna</i>	Blue Gum	Margins of Toongabbie Creek main channel, not western tributaries
<i>Eucalyptus amplifolia</i>	Cabbage Gum	
<i>Eucalyptus resinifera</i>	Red Mahogany	Margins of Toongabbie Creek main channel, not western tributaries
<i>Eucalyptus globoidea</i>	White Mahogany	Upper Toongabbie
<i>Angophora floribunda</i>	Rough Bark Applie	Upper bank
<i>Angophora bakeri</i>	Narrow-leaved apple	Upper bank
<i>Casuarina glauca</i>	Swamp Oak	
<i>Backhousia myrtifolia</i>	Grey Myrtle	
<i>Acacia parramattensis</i>	Parramatta Wattle	
<i>Acacia floribunda</i>	Gossamer Wattle	
<i>Acacia longifolia</i>	Sydney Golden Wattle	Upper bank
<i>Tristaniopsis laurina</i>	Water gum	
<i>Melaleuca decora</i>	Snow in Summer	
<i>Melaleuca styphelioides</i>	Prickly Leaved Paper Bark	
<i>Lomandra longifolia</i>	Matt Rush	
<i>Hardenbergia violaceae</i>	Happy Wanderer	Top of bank