



WILLOWS IN THE HUNTER

SINCE THE 1950 s, WILLOWS have been used extensively and **successfully throughout the Hunter Valley to help stabilise degraded streambanks.** However, over time this consistent use of willows has caused unexpected changes to the ecology and physical characteristics of our rivers and streams.

The establishment of more than two million willow seedlings in the Bega River in southern New South Wales in 1993, and recent evidence that willows are spreading throughout New South Wales and Victoria, prompted the 1998 declaration of most willow species as noxious in New South Wales. A draft national willows strategy has also been developed.

A recent study indicates that Hunter streams provide ideal conditions for the production and germination of willow seeds. While flooding in many streams has, to date, prevented the survival of most willow seedlings, the potential exists for mass establishment of willow seedlings in the Hunter.



a guide to

IDENTIFICATION & MANAGEMENT

WHAT'S THE PROBLEM WITH WILLOWS?

Willows establish easily from cuttings, grow rapidly, produce fine matted roots—ideal for stabilising soils—and require little attention after planting. They have been used as a cost-effective means of stabilising Hunter streambanks for the past five decades.

However, their natural spread enables willows to exploit river environments, displacing native species, colonising gravel and sand bars in streams, diverting floods and, in some cases, causing erosion of vulnerable streambanks.

In recent years, mass seedings of wil-

lows in New South Wales and Victoria have dispelled the myth that willows in Australia cannot produce viable seed. Willows usually occur as either male or female plants. All willow species in Australia occurring as female plants, except one sterile shrub willow, are now known to produce viable seed. These species also occur as male plants and can breed, not only with females of their own species, but are also able to hybridise with other species of the same group (either tree willows or shrub willows).

The potential for mass germination and establishment of willow seedlings

throughout New South Wales prompted the 1998 declaration of most willow species as W4 noxious under the *New South Wales Noxious Weeds Act 1993*, which prohibits their sale and propagation. The true weeping willow (*Salix babylonica*) and two pussy willows (*S. X reichardtii* and *S. X calodendron*) are the only willows currently not declared noxious.



The Bega River in southern New South Wales choked by young willows.

THE HUNTER: A POSSIBLE NURSERY FOR WILLOWS

In 1998, the New South Wales Department of Land and Water Conservation (DLWC) commissioned Australian willow expert Kurt Cremer to assess the potential for willows to spread in the Hunter. His report highlighted four key issues:

- ▶ Most Hunter streams provide ideal conditions for fertile willow seeds to germinate.
- ▶ To date, germinated plants rarely have sufficient time to establish between flooding which washes most seedlings away.
- ▶ Contrary to previous knowledge, both male and female willows commonly occur in the Hunter and have produced masses of fertile seed in recent seasons.
- ▶ While stream management practices and natural flood conditions have

prevented mass germination of willows in Hunter streams, a slight change in flood conditions could lead to the major establishment of willow seedlings, particularly if more aggressive willow species, such as the black willow, are introduced to the area.



Willow expert Kurt Cremer (far right) helps DLWC field staff identify willow species.

Identifying the sex of willows

Accurate identification of willows as male or female, and as a tree or a shrub willow, is essential for their effective management. The sex of willows is best determined by their flowers or fruits which usually occur in September–October.

Willow flowers form a catkin: a dense spike-like structure with an arrangement of tiny, single-sex flowers. Catkins can be upright or spreading and usually have several dozen flowers in each.

A hand lens may be required to help you clearly determine the sex of a willow.



♂ Male flowers

Each male flower can have one to eight stamens, but usually two. Each stamen consists of a thin stalk tipped with two pollen sacks which release yellow pollen when mature. The male catkin drops off once the pollen is shed. Each pair of stamens is supported by a single scale.



♀ Female flowers

Each female flower scale supports a single ovary, topped by a divided stigma that collects pollen (top). The ovary later matures into a capsule that splits into two halves and releases fluffy seed (bottom). Seed is generally shed in October–November followed by the shedding of the female catkin.

Identifying willows

Identifying common willow species of the Hunter

Identifying the exact species of a willow, especially hybrids, can be difficult. Following is a guide to help you identify the most common willows (noxious and non-noxious) *currently* found in the Hunter. If you find a willow on your property that you cannot identify, it is important that you contact your local office of the Department of Land and Water Conservation, or your local council weeds officer, for assistance with correct identification (see contact details over).

Weeping willow (*Salix babylonica*) (Not declared noxious)
–**OCCURRENCE** Common throughout the Hunter both along and away from streams. –**FORM** Weeps strongly in all parts of globular crown; twigs slender and can hang vertically for 1–2m; single short trunk typically divided into three to six sturdy sub-trunks forming irregular arcs; grows to 20m but usually smaller. –**FLOWERS** Female –**NOTE** While easily distinguished from the pencil and tortured willows, weeping willow can be difficult to distinguish from its many hybrid forms, including the W4 noxious weeping/basket hybrid.

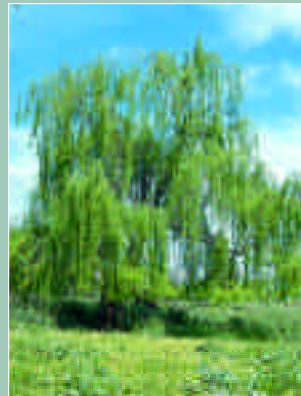
Pencil willow (*Salix humboldtiana* 'Pyramidalis')
(W4 Noxious)

–**OCCURRENCE** Currently rare along Hunter streams, but found in many suburban and country gardens. –**FORM** Easily distinguished by columnar shape (similar to the Lombardy poplar); grows to 15 m; evergreen in warmer areas. –**FLOWERS** Male –**NOTE** This species is closely related to the black willow (*S. nigra*) which is currently NOT found in the Hunter. Report any sightings of black willow to your local DLWC office as it is a very invasive species.

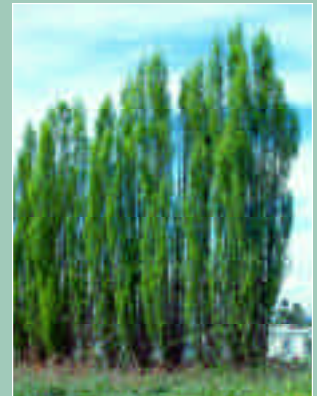
Weeping/basket willow hybrids (W4 Noxious)

–**OCCURRENCE** Very common willow found both along and away from Hunter streams; established by planting and by self-seeding. –**FORM** Eight hybrid forms identified, including females, males and bisexuals; range from strongly weeping to strictly upright; leaves and flowers very similar to true weeping willow; known in the Hunter as basket willow and St Johns willow. –**COMMON MALE HYBRID** Globular crown only slightly weeping, mainly in lower crown; yellowish appearance compared to the greener common female hybrid; scaly bark occurs on branches greater than 5–10 cm in diameter. –**COMMON FEMALE HYBRID** Weeps strongly in all parts of globular crown; several vigorous upright stems with ascending tips often emerging above the crown; scaly bark occurs on branches greater than 25cm in diameter with the remainder of the branches smooth and green-greyish in colour.

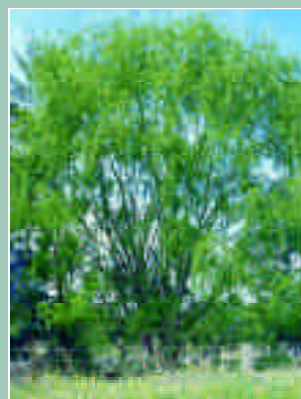
Tortured willow (*Salix matsudana* 'Ārtuosa') (W4 noxious)
–**OCCURRENCE** Currently rare along Hunter streams, but found in many suburban and country gardens. –**FORM** Contorted branches and leaves; typically one to four trunks; globular crown to 15 m tall; slightly weeping. –**FLOWERS** Female



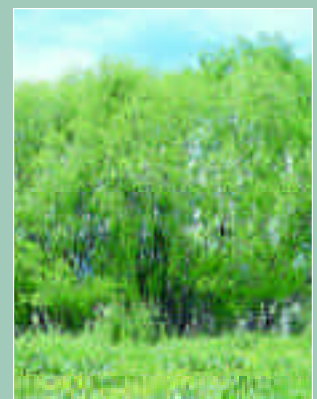
Weeping willow
(*Salix babylonica*)



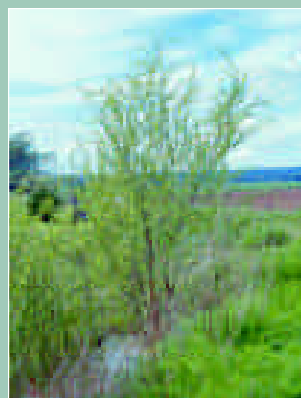
Pencil willow (*Salix humboldtiana* 'Pyramidalis')



Weeping/basket willow
hybrids — female



Weeping/basket willow
hybrids — male



Tortured willow
(*Salix matsudana* 'Ārtuosa')

MANAGING WILLOWS IN THE HUNTER

In response to new knowledge about the potential spread of willows, DLWC Hunter Region has identified the need for gradual replacement of willow species with suitable native species.

A collaborative project between Wollombi landcarer Bill Hicks, DLWC, the Hunter Catchment Management Trust and the Natural Heritage Trust, has encouraged the development of

longstem native tubestock, a native plant alternative to willows for streambank stabilisation (see below).

Following the success of longstem trials, DLWC river crews and landcarers working along the Hunter River and its tributaries are now planting thousands of longstems in place of willows. Contact DLWC for advice on willow replacement.

LONGSTEMS: A VIABLE ALTERNATIVE TO WILLOWS

Long before the declaration of many willows species as noxious, Hunter Valley landcarer Bill Hicks (left) was concerned about the potential problems associated with the almost exclusive use of willows for streambank stabilisation. In 1994,



Bill began developing an innovative method for growing and planting native trees. His goal was to produce a native tubestock that could establish easily, grow rapidly, produce extensive roots and require little attention after planting—just like willows. By August 1997, Bill had developed his own alternative to willows: longstem native tubestock or 'longstems'.

Information on longstems is available in the complementary DLWC publication *Rehabilitating Australian Streambanks with Longstem Native Tubestock*.

How can I help?

Riparian landholders have a vital role to play in helping to manage willows in the Hunter. You can help to control the spread of willows on your property by:

- ▶ Learning to identify and monitor both the species and sex of willows to ensure that only same-sex plants are present at any one locality
- ▶ Keeping male and female willow plants at least 2 km apart
- ▶ Monitoring the general health of your stream, including changes in bank stability, the number and distribution of native and exotic species, and increased sedimentation and/or erosion
- ▶ Not planting willows on your property; seek advice from relevant groups and agencies about alternatives for riparian planting
- ▶ Removing all live willow branches

that have fallen into streams

- ▶ Removing any young willows that have grown from seed
- ▶ Alerting DLWC officers about any existing or potential problem with willows on your property

Willows can play a key role in stabilising streambanks and any attempt to remove or otherwise control them should be done in consultation with the Department of Land and Water Conservation. If you have willows on your property that you think should be removed, check with your local DLWC Rivercare officer for management advice.



Where can I get more information?

For information on local willows control programs, contact your local Rivercare Officer at the Department of Land and Water Conservation:

Newcastle
Suite 6, 464 King Street
Newcastle West NSW 2302
(PO Box 2213, Dangar NSW 2309)
Ph (02) 4929 4346 Fax (02) 4929 6364

Singleton
Joint Coal Board, Suite 6/1 Civic Avenue
(PO Box 4)
Singleton NSW 2330
Ph (02) 6572 1707 Fax (02) 6572 1592

Muswellbrook
3–5 Market Street (PO Box 297)
Muswellbrook NSW 2333
Ph (02) 6542 1222 Fax (02) 6543 4164

Scone
Gundy Road (PO Box 283)
Scone NSW 2337
Ph (02) 6545 1666 Fax (02) 6545 2520

To obtain a copy of a video about longstems contact:

Bill Hicks, Norkhil Technologies
Ph (02) 4998 8387
Fax (02) 4998 8364

For more detailed information on identifying and managing willows the following publications are recommended:

- Cremer, K.W. 1995, *Willow Identification for River Management in Australia*, Technical Paper No. 3, CSIRO Division of Forestry, Canberra.
- Cremer, K.W. 1999, *Willows Management for Australian Rivers*, special issue, Australian Association of Natural Resource Management, Canberra.
- Trounce, B. & Cremer, K.W. 1997, *Willow Control*, New South Wales Agriculture, Orange.

All available from:

Bob Trounce, Weeds Agronomist,
New South Wales Agriculture,
Locked Bag 21, Orange NSW 2800
Ph (02) 6391 3100
Fax (02) 6391 3336

<http://www.ffp.csiro.au/publicat/articles/willows>