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Case Study 1

State-wide eradication of seeding willows in Tasmania



Sam Smee, Tasmanian Land and Water Professionals

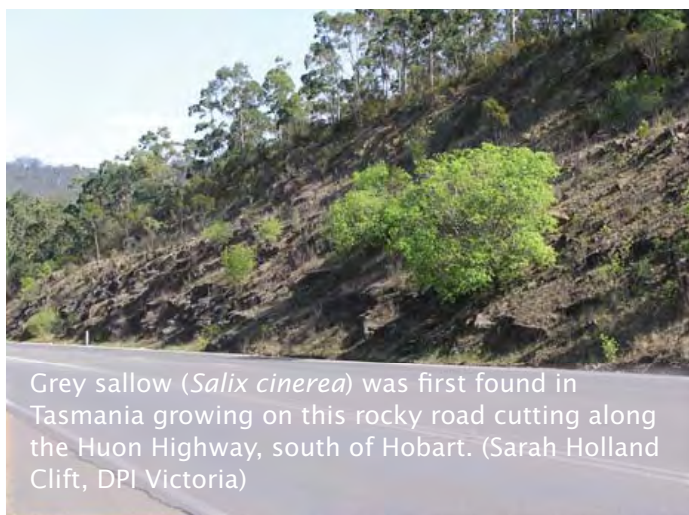
What and where?

Grey willow (*Salix cinerea*) was first noticed in Tasmania on a rocky road cutting on a main highway south of Hobart in 2000. Its discovery led to many other infestations being found in the surrounding area, where the seed had been carried by wind or water.

As soon as grey willow was discovered growing in Tasmania, it wasn't long before it was identified at other sites around the state. A large infestation was found growing along a railway line at Queenstown on Tasmania's west coast, for example, and another was found infesting a boggy area alongside a highway at Penguin on the north-west coast. Grey willow was also sighted growing in a paddock at Edith Creek in north-west Tasmania.

Why manage willows?

Grey willow's ability to produce prolific amounts of seed make it one of the most invasive willow species



Grey willow (*Salix cinerea*) was first found in Tasmania growing on this rocky road cutting along the Huon Highway, south of Hobart. (Sarah Holland Clift, DPI Victoria)

in Australia and, when conditions are suitable, can lead to massive outbreaks of seedlings. Such events have already been observed in Victoria and New South Wales, following disturbances that have exposed moist soil, such as fire, floods or land clearing (see 'Seeding willows: It may not happen overnight, but it will happen' in Section 1 Understanding willows).

The discovery of grey willow in Tasmania has prompted fears about its potential threat to the unique ecology of the Tasmanian wilderness, including the nearby World Heritage Areas, should it ever gain a strong foothold. Hopefully its early discovery, however, has created an opportunity to potentially eradicate grey willow in Tasmania before it becomes firmly established.

"Seeing Tasmania's first significant population of seeding grey willow is like going back in time and seeing Australia's first introduced blackberries. We have a chance to do something to protect Tasmania from even greater willow invasion."

Andrew Crane, Weed management Officer, DPIW, Tasmania

Who to involve?

Following the initial discovery of grey willow in southern Tasmania, Kingborough Council, in conjunction with the Tasmanian Herbarium and the Department of Primary Industries and Water (DPIW), sourced funds and started control works. It soon became obvious, however, that a much larger, state-wide program was needed.

In response to this challenge, the DPIW teamed up with Tasmanian Land & Water Professionals Pty Ltd. to develop an action plan to combat the threat of grey willow. With funding from the Australian government's *Defeating the Weed Menace* programme, the Tasmanian Seeding Willows Project began in July 2006.



Local landowners learn about grey sallow at a field day at Leslie Vale, south of Hobart. (Sam Smee, Tasmanian Land and Water Professionals)



Volunteers from West Coast Wilderness Railway help control grey sallow in Queenstown, using the cut, paint and remove method. (Sam Smee, Tasmanian Land and Water Professionals)

With infestations spread out across the state, it was vital to engage public support to identify and report other infestations. A public awareness campaign was launched across all media and many new sightings were reported as a result. On inspection, all of these new sightings turned out to be *Salix x reichardtii*, a hybrid form of grey sallow that looks very similar.

“We have that all-important community support that is vital for success; a network of eyes right across the state, observing and reporting any suspect willows. That sort of thing is priceless.”

Sam Smee, Tasmanian Land & Water Professionals

When and how to conduct the works?

With the clear aim of eradicating grey sallow from Tasmania, the state-wide project has embarked on a campaign with three areas of activity as its focus:

Investigate...Educate...Eradicate

In July 2006, investigations began straight away with on-ground surveys to determine the extent and density of known infestations, followed by mapping of surrounding areas to unearth any additional, outlying plants. In particular, wet areas downstream and downwind of known infestations were targeted. All plants found were recorded with a GPS (Global Positioning System), following national weed mapping standards, and downloaded into GIS (Geographic Information System) software to generate accurate maps.

Once positively identified, all infestations of grey sallow were controlled, from November through to April. A combination of techniques was used to maximise control of the willows, while minimising environmental damage.

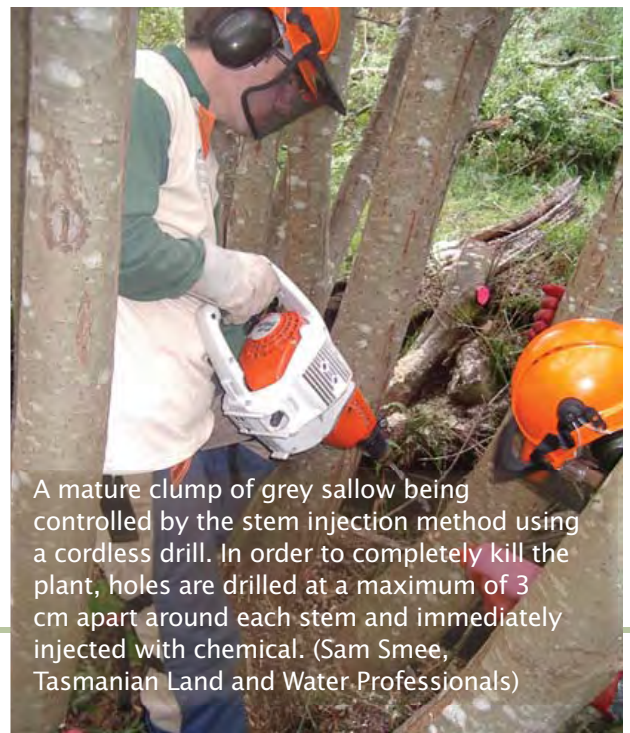
Monitoring, evaluation and review

After one and a half years of the three-year project, many more infestations of grey sallow have been found. The goal of state-wide eradication, however, is still feasible. An important biological trait in the project's favour is that, unlike many other weeds, grey sallow seed is short lived, surviving only up to six to seven weeks.

The project is scheduled to continue until June 2009. Meanwhile, any new plants positively identified as grey sallow will be immediately controlled. Review is an ongoing process and all sites will be revisited for at least two years following control to assess and control any regrowth.

“We may be stuck with blackberries, but grey sallow is one weed that won't be allowed to become another blight on our landscape.”

Sam Smee, Tasmanian Land & Water Professionals



A mature clump of grey sallow being controlled by the stem injection method using a cordless drill. In order to completely kill the plant, holes are drilled at a maximum of 3 cm apart around each stem and immediately injected with chemical. (Sam Smee, Tasmanian Land and Water Professionals)

Case Study 2

Turning a degraded urban waterway into an enhanced riparian corridor in Victoria



Damian Magner, Melbourne Water

What and where?

Once a typical example of urban waterway degradation, the willow and weed landscape of a small urban tributary of Back Creek in eastern metropolitan Melbourne has been transformed into an enhanced riparian corridor, appreciated by the local community. The 500-metre section of creek is located in South Surrey Park.

Why manage willows?

In 1997, prompted by community and local council interest in improving the park and creek, a master plan was drawn up with significant input from local residents. With the support of Melbourne Water, the responsible authority for the area along the creek, a rehabilitation program began that involved the removal of willows and other weeds, as well as channel stability and revegetation activities.

Who to involve?

The project was managed by Melbourne Water's capital works program, which is funded through a drainage rate contribution paid by Melbourne households. Contractors conducted the initial works and the Friends of South Surrey Park and local council completed the revegetation works with funding from Melbourne Water's river health grants program.

As with many urban areas, the local community's views about the value of willow trees included some park users who objected to their removal. There was also the potential negative impact of construction noise and visual disturbance to private properties that backed on to sections of the creek. To reduce the impact of noise on local residents, rock delivery (for grade control structures) was timed to take place when most

residents were away from home. To reduce the visual impact, works were staged over several years, to enable native vegetation to establish.

An information leaflet, which included the proposed plan, was distributed to all properties adjoining the site to give them an opportunity to comment and ask questions. Information signs, including the contact details of the relevant project officer, were also placed on site.

"People said they used to be hesitant to go down along the creek, due to the dark and seedy atmosphere that the willows created. Since the willows were removed, we have had very positive feedback from park users and the surrounding community."

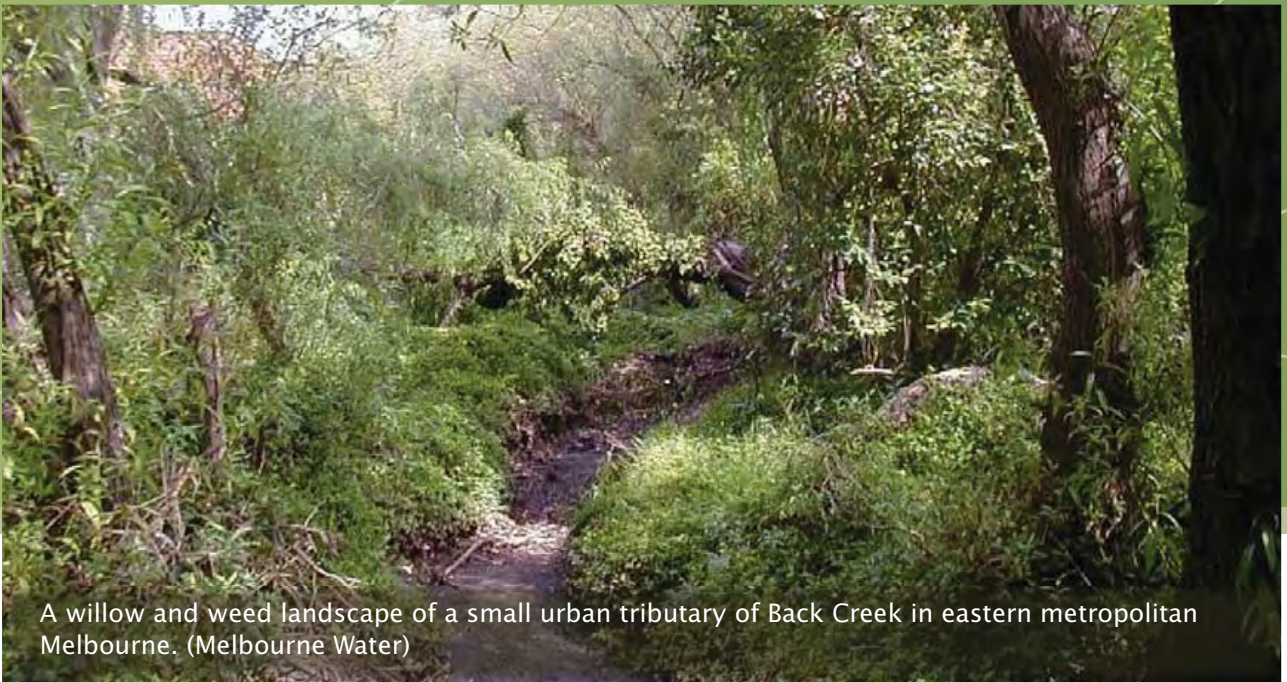
Damian Magner, Melbourne Water

When and how to conduct the works?

Rehabilitation works were undertaken in four separate stages over a number of years, to reduce the visual impact of tree removal. The first stage, for example, was already revegetated and growing before stage two was begun.

Before starting willow removal works, other weeds at the site were controlled, such as blue morning glory (*Ipomoea indica*), English ivy (*Hedera felix*) and tradescantia (*Tradescantia fluminensis*). In some locations, willow and oak trees were retained to provide screening and to keep a partly treed character to the riparian zone. These trees will be removed in the future, once revegetation growth has advanced.

Because the willows were small and the creek was ephemeral at the upstream end, the willows were cut down green, removed and the remaining stumps painted with herbicide. In later stages, willows and other woody weeds



A willow and weed landscape of a small urban tributary of Back Creek in eastern metropolitan Melbourne. (Melbourne Water)

were stem injected, felled soon after and the remaining stumps also painted with herbicide. All stumps were left in the ground. Where there were major stability issues, a detailed survey and design was undertaken and grade control structures installed.

Because of a lack of remnant vegetation in the area, the site was actively revegetated after each stage of works. A dense ground layer of native species was established to out-compete weeds that otherwise continually reinfest such urban areas. Shrub and tree species were planted more sparsely to give a more open view of the river.

Monitoring, evaluation and review

The revegetation contracts include a three-year maintenance program, which also covers the removal and control of any willow regrowth. After these contracts are completed, the site will be

monitored and maintained as part of Melbourne Water's recurrent maintenance program.

The urbanised nature of the catchment, as well as the existence of upstream willows and other woody weeds (for example, desert ash) which may continue to reinfest the site, will make constant monitoring necessary. Melbourne Water is committed to ensuring that the site is maintained over the long term.

"This has resulted in a positive result for both the community and the environment. The area now feels safer, looks more pleasant, water quality has improved, flows have increased and there is now more suitable habitat for native species along the river."

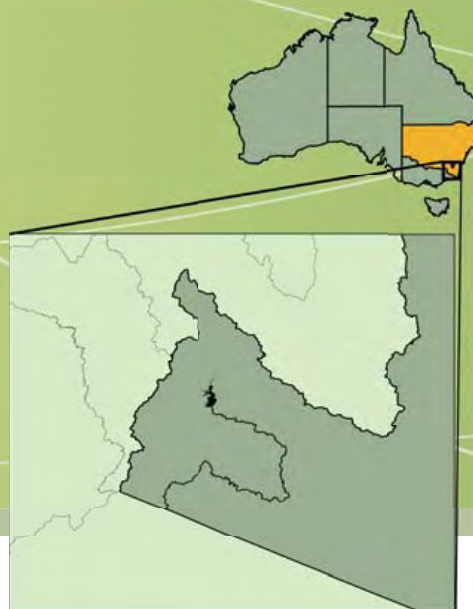
Damian Magner, Melbourne Water



Revegetation with native plants and channel stabilisation. Note the Oak tree at centre left is being temporarily retained to provide some tree cover until native vegetation establishes. (Melbourne Water)

Case Study 3

Willow control along the Snowy River in NSW



What and where?

The Snowy River in New South Wales runs through 105 km of privately held land, and 165 km of the Kosciusko National Park. In 1967, it was dammed at Jindabyne as its final diversion under the Snowy Mountains Scheme, which reduced flows at Jindabyne to 1% of the mean average natural flow. The Snowy River Rehabilitation Project, as implemented by the Southern Rivers CMA, primarily focuses on the Snowy River and tributaries below Jindabyne Dam to the Victorian border.

Why manage willows?

After 30 years of flow diversion, riparian weeds including willows and blackberry established extensively on the accumulated sand and silt within the wide, 'de-watered' river channel. The Snowy River had become an indistinct, braided channel, with poor water quality and a stream biota more typical of a lowland wetland than a mountain river. In anticipation of an environmental flow eventually being delivered, local catchment managers began to map and selectively remove seeding willows from the mid-1990s. In August 2002, an ideal opportunity presented itself to remove remaining willows to help rehabilitate the stream bed when the New South Wales, Victorian and Commonwealth governments announced the gradual return of environmental flows to the Snowy over the next ten years.

Who to involve?

The project called on the skills of many organisations and individuals including:

- Local and regional natural resource management staff (particularly the Southern Rivers Catchment Management Authority).

- The late Dr Kurt Cremer, a research scientist with excellent knowledge of willow biology and identification.
- Willow managers from other areas, who helped determine management and control techniques.
- Local contractors, who conducted on-ground works.
- Local community interest groups who sat on the initial steering Committees.

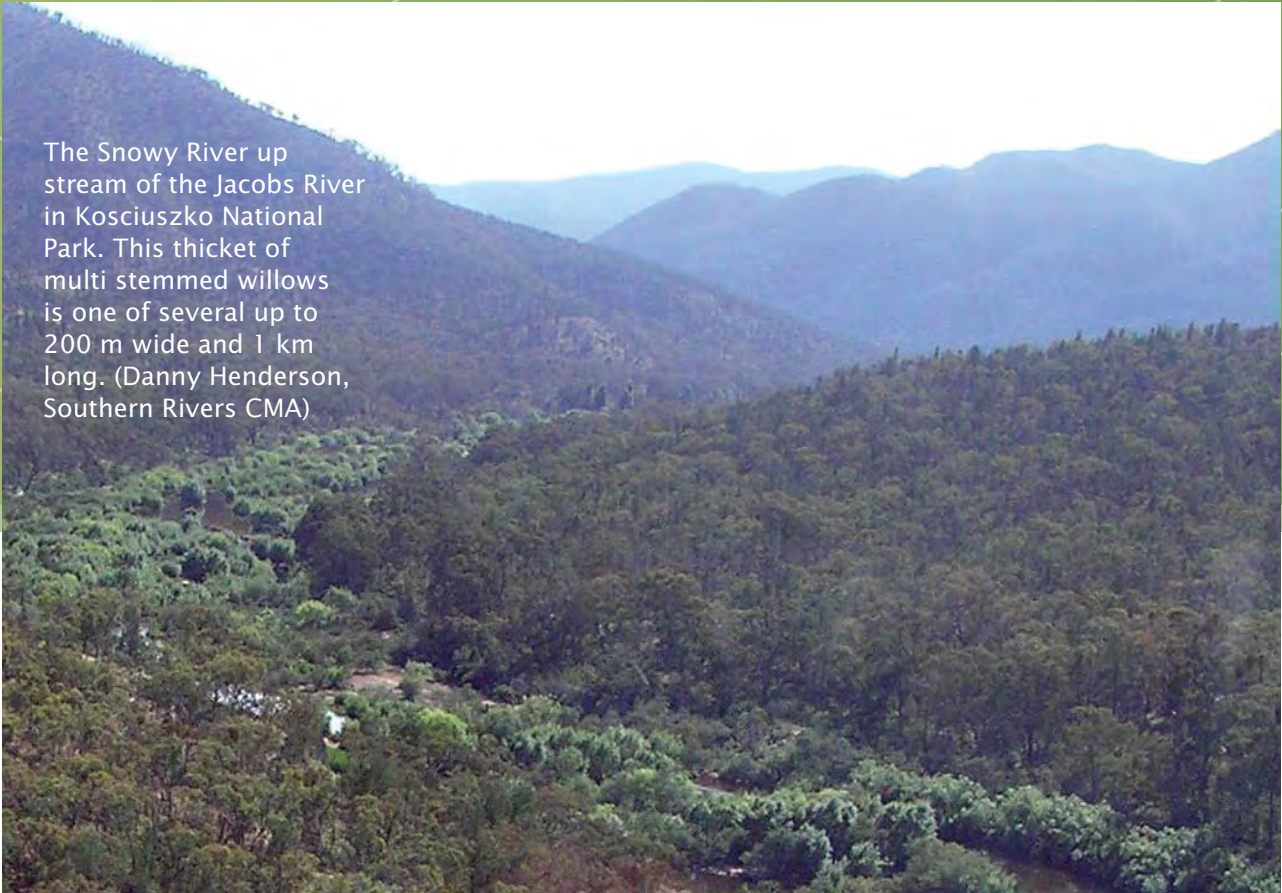
The entire program is coordinated by an agency-community reference group, which meets annually to review issues and outline future programs. The use of local contractors and plants sourced from local nurseries has added economic value to the region.

Riverfront landholders, whose tenure is typically to 'the high bank', were kept informed throughout the project and their consent formally sought before willow control took place on or adjacent to their lands. Project staff attended field days, shows and local events to explain the program and to gain feedback from the community.

There are now very few people who do not support willow removal along the Snowy. Those with initial objections changed their minds once they saw the results and the improvements in river health that followed increased flows.

"By involving adjacent landholders throughout the process, willows have now been managed along 98% of the river's length in New South Wales and there is a strong community acceptance of the program and its benefits for the river."

Danny Henderson, Southern Rivers CMA, New South Wales



The Snowy River up stream of the Jacobs River in Kosciuszko National Park. This thicket of multi stemmed willows is one of several up to 200 m wide and 1 km long. (Danny Henderson, Southern Rivers CMA)

When and how to conduct the works?

Mapping

A comprehensive survey of willows along the Snowy River in spring, when catkins had emerged, determined the sex of the trees and identified 17 different willow taxa. An aerial inspection along remote sections of the Snowy in autumn, when the trees were changing colour, was recorded on video to give managers and contractors a logistics planning tool.

Control

Following the initial survey, female trees were targeted to prevent future spread by seed. From 2002 onwards, the Australian and state governments jointly funded a full-scale operation to control problem willows from the Snowy River channel below Jindabyne Dam. The program targeted all willows, including crack willow (*S. fragilis*), purple osier (*S. purpurea*) and a range of hybrid species. Many weeping willows (*S. babylonica*) were retained in areas where they were identified as significant by the community or landholders.

Control techniques varied, according to the size and type of willow. Seedlings were foliar sprayed, purple osier and other 'shrub' willows were cut, painted and removed (over time this technique proved less successful than stem injection) and adult 'tree' willows were stem-injected using glyphosate and left standing to break down naturally. In areas where 'tree' willows posed a risk to people or were of concern to landholders if left standing, they were felled and burned.

Funding

Funding was achieved by building an early consensus on control targets and methods, maintaining both strong community support and priority for the program in core budget processes, and using this to leverage funds from a range of annual grant processes. Major investment was secured from the Australian Government Natural Heritage Trust, NSW Department of Premier and Cabinet, and the NSW Environmental Trust. Willow control cost as much as \$18,000 per km in braided sections of the river (stem injection only, 2005) and up to \$30,000 per km in areas where willows had to be cut, painted and removed (2002). Follow-up treatment, if done within two years of initial work, cost around \$1,000 per km of river.



This particular section of river has up to five deep channels separated by rocky bars. Treatment cost was approximately \$18,000 per km. (Danny Henderson, Southern Rivers CMA)

Monitoring, evaluation and review

Field inspections by project staff and a detailed reporting process by contractors provide measures of the program's success. Key lessons which have emerged so far include:

- Control was possible at all times of year, but success was less certain in spring.
- Some trees treated successfully during summer, autumn or winter still grew new leaves in spring, but soon after dropped these leaves and died.
- The success of stem injection treatment was reduced if flood waters inundated freshly treated axe cuts within 24 hours of treatment.
- The success of foliar spraying using glyphosate was reduced if seedlings were coated in silt from flood inundation.
- Control costs varied depending on the type, density and location of the willows. Large, dense infestations in easy-to-access areas, for example, were often cheaper to treat than sparse infestations of small, multi-stemmed or flood-damaged trees among blackberry or in difficult terrain.



Willow contractors preparing to commence remote operations on the Snowy River within Kosciuszko National Park. (Danny Henderson, Southern Rivers CMA)



Follow-up foliar spray work was not done soon enough at this site, making treatment of these multi-stemmed three year old willows a similar cost to the initial treatment. (Danny Henderson, Southern Rivers CMA)

- Competition between contractors and repeated experience has led to more efficient control methods. Contractors discovered, for example, that ‘shrub’ willows (some with up to 250 stems ranging from 5-20 cm diameter) could be controlled more efficiently and effectively by selective removal of stems to allow operator access, and then injecting most of the remaining stems, rather than the full ‘cut and paint’ method.
- Dead willow break-down depended on site conditions and tree type. Many trees collapsed within two years of treatment, but some trees in elevated, dry sites or in water remained standing five years later. Mature crack willow (*Salix fragilis*) trees often remained intact, eight years post-treatment. Break down has been quicker in areas periodically inundated, compared to permanently wet or dry areas.
- Willow seed continues to spread into controlled areas. It is thought that this seed comes from trees planted for shelter or as ornaments on nearby properties or from the female weeping willows (*Salix babylonica*) not controlled along the river.
- Environmental flows released into the Snowy River in 2002 changed river levels, which in turn regularly wetted areas previously continually dry. Although this had obvious benefits for the river, it also led to willow regrowth and increased opportunities for establishment. Rapid expansion of reeds into these newly wetted areas hid willow seedlings until they were more than two metres high, making follow-up control more expensive.

Willows may still reinvade from upstream tributaries or from seed blowing in from elsewhere. Initial control on 185 km of river has taken 4 years and will require follow-up monitoring for a number of years to control new infestations. Willow removal has been the single, largest management intervention in the physical rehabilitation of the Snowy River, and will remain so until environmental flow levels are substantially increased. It is expected that benefits to river channel recovery and formation will be much greater level than if willow control had not been achieved.

A detailed monitoring and review program has meant that the project could be improved and adapted over time, as new information was gained.

Case Study 4

Black willow eradication in the Riverina region of NSW



What and where?

Black willow (*S. nigra*) was originally imported from North America and planted in the Tumut area of New South Wales between 1964 and 1977 for forestry purposes. In the intervening 37-year period, black willow spread over hundreds of kilometres throughout the region, with self-sufficient populations thriving. Other infestations also exist in Victoria and other parts of NSW.

Why manage willows?

Black willow is vigorous and produces massive amounts of seed, which are dispersed by wind and water. A number of plantation areas, scattered throughout the region, have been identified as the seed source for self-seeding black willow populations within a 100 km radius of Tumut. Although the original plantations have been destroyed, naturalised populations of black willow now exist throughout the region.

If left unchecked, black willow has the potential to infest and dominate rivers and streams throughout the region but, at present, it is still feasible to completely eradicate it. Other willows were also causing problems along the river, but black willows were specifically prioritised for control because of their increased risk of spread.

A coordinated control program in the nearby upper Murrumbidgee catchment had almost completely eradicated black willow from that region, and its success encouraged hope that the aim of eradication in the Riverina was achievable.

Who to involve?

The *Riverina Black Willow Management Plan* commenced in 2002 to protect waterways and the general environment from increasing black willow invasion. To ensure that this aim was met, the Black Willow Working Group and Tumut-Adelong Region Catchment Management Group

were formed to oversee the management plan's objectives.

Central to the success of the plan was the education of land managers, including government agencies, and the general public about the problems posed by black willow, so that they could play a key role in its detection and control across the region.

The New South Wales Government also responded by declaring black willow as a Control Class 3 noxious weed in local government areas where it posed a serious threat and there was strong community support for its control. This level of declaration requires black willow to be '*fully and continuously suppressed and destroyed*'.

When and how to conduct the works?

By continually suppressing and destroying black willow, the long-term aim of the management plan was to totally eradicate it from the region within 10 years. To achieve this, the short-term objectives were to:

- Remove all dense infestations of seeding willows located along Blowering Dam and Adelong, Bombowlee, Goobarragandra and Batlow creeks.
- Remove all scattered or marginal infestations located along Tarcutta and Umbango creeks and the Murrumbidgee River at Gundagai.
- Locate and treat rare and isolated infestations.
- Identify and treat any new seedlings found.

Half a million seedlings and adult plants were removed along a 40 km stretch of the Murrumbidgee River between the Burrinjuck Dam in NSW and the ACT border in spring and autumn by private contractors in teams of 3 or 4.

Control methods varied depending on the size of the willow. Small seedlings were foliar sprayed

Black willows growing near Tumut, New South Wales. (Cherie White, Murrumbidgee CMA)



using backpack sprayers, 1-3 m high willows were cut, painted and removed and larger trees were stem injected and left standing, being careful to treat all stems. In all cases, the chemical used was Roundup Biactive™. Large trees were only removed where they posed significant risk to nearby downstream infrastructure.

Monitoring, evaluation and review

Following initial control works, it was discovered that some adult willows remained and new seedlings had emerged. During follow-up control conducted over the following 2 years, more than 100,000 seedlings were removed. Luckily, early detection meant that these emerging seedlings were easily controlled by hand pulling or cut and paint methods.



Black willow seedlings growing out of a road, near Tumut, New South Wales. (Cherie White, Murrumbidgee CMA)

Had the black willow seedlings not been detected and controlled so quickly, these seedlings could have grown much larger and become much more difficult and costly to control later on.

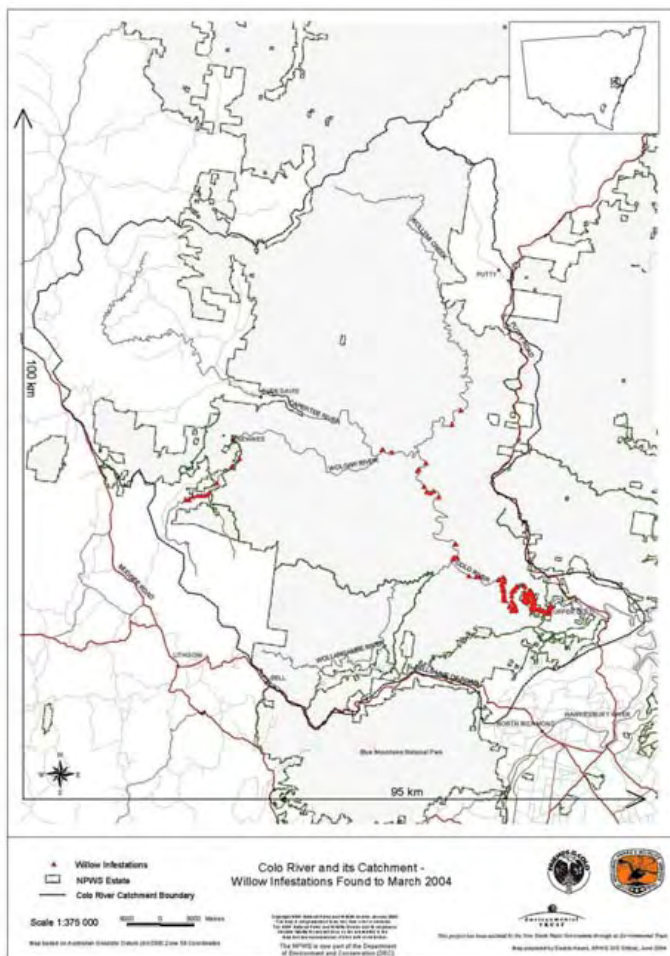
Thanks to the coordination and commitment of this program, black willow has now almost been completely eradicated from the area. Having educated local land managers and community groups, these people can now carry out the on-going monitoring, evaluation and control work needed to keep black willow at bay.



Stem injection via fill and frill method. (Cherie White, Murrumbidgee CMA)

Case Study 5

Willow eradication in the rugged wilderness of Wollemi National Park, NSW



What and where?

The Wollemi National Park has been the scene of a vigorous campaign against invading willows, involving community volunteers and the New South Wales National Parks and Wildlife Service (NPWS). Black willows (*S. nigra*) were originally imported from the USA and planted along the lower reaches of the Colo River in the late 1960s. Although they were later removed by a flood,

their offspring had already spread down along the river and upstream into the Wollemi National Park.

The problem was first brought to the attention of the NPWS in 1998 by a bushwalker alarmed at the number of willows along the river. In a subsequent survey, about 5000 trees were recorded along a 60-70 km section of river within Wollemi National Park. Later surveys downstream of the park, to the junction with the Hawkesbury River, found another 5000 trees as well as galleries of an estimated 7000 seedlings in the wetlands in the side creeks.

Why manage willows?

The Wollemi National Park and Wilderness Area, home of the Wollemi Pine, contains the largest remaining areas of wilderness in New South Wales and is part of the Greater Blue Mountains World Heritage Area. The spread of black willow into the park along the Colo River, the major river running through the park, posed a major threat to the integrity of the World Heritage Area.

Considered one of the worst willows in Australia, black willow produces abundant amounts of seed and has been known to spread up to 100 km from its initial source. It was originally thought that willows were spreading in from areas upstream. Surveys along tributaries of the Colo, however, found that the infestations in the Wollemi National Park were initiated from seed blown up the river from large galleries of black willow growing downstream.

Once black willow was discovered in the Wollemi National Park, an eradication campaign was started to protect the park and surrounding areas from its impacts and further spread.



Bounded by 200-300 m cliffs, much of the Colo River is relatively inaccessible through normal means, but makes for some fun rafting trips. (Friends of the Colo)

Who to involve?

Bounded by 200-300 m cliffs, much of the Colo River is relatively inaccessible through normal means. There are few walking tracks, even fewer roads and it flows through a rugged wilderness area. Through the enthusiasm of the NPWS staff, local bushwalkers and canoeists, a community group, Friends of the Colo, was formed to help tackle the problem and make a long-term commitment to eradicating invasive willows from the Colo River catchment. Groups of volunteers and NPWS staff travelled down the Colo River in canoes and rafts, identifying and controlling willows as they went.

In 2005, the community group Willow Warriors Inc. was formed as an offshoot of Friends of the Colo, to expand their work to other remote rivers in south-eastern Australia. Willow Warriors Inc. is currently involved in willow management projects along the Goobarragandra, Grose, Murrumbidgee, Shoalhaven, Hawkesbury-Nepean, Wollondilly and Wingecarribee Rivers.

Both groups are strongly supported by the NSW National Parks and Wildlife Service, NSW Environment Trust, Australian Government Envirofund, Hawkesbury-Nepean Catchment Management Authority and local councils.

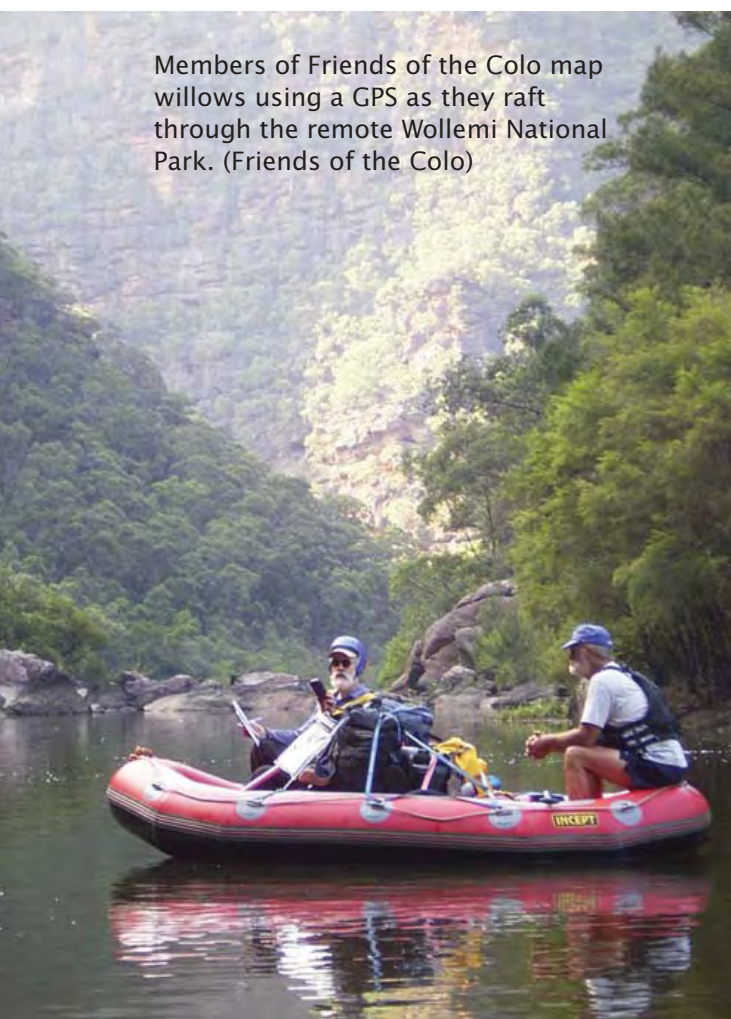
When and how to conduct the works?

Friends of the Colo used a variety of methods for surveying, recording and controlling willows. These included inflatable rafts or canoes, walking (carrying all equipment by backpack) and helicopter (to get volunteers into areas inaccessible by other means).

The following key activities outline the group's approach:

- **Train volunteers** – Volunteers were well trained in whitewater and wilderness safety at awareness days held at Penrith Whitewater Stadium and accompanied by experienced whitewater rafting guides on most trips. Volunteers were also trained in willow identification, weed mapping and treatment techniques.
- **Determine the extent of the problem** – The size, type and location of willows were recorded by site in the wilderness area, and then by 200 m transects along the river outside the park. The experience gained from this project led Willow Warriors to map willows by species in 200 m transects on their projects to ensure they could assess the

Members of Friends of the Colo map willows using a GPS as they raft through the remote Wollemi National Park. (Friends of the Colo)



amount of work involved in the catchment and prioritise the tasks required.

- **Treat willows** – Groups of volunteers travelled down the Colo River in canoes and rafts, stopping to apply glyphosate to willows by stem injection. A dye was used in the glyphosate to clearly mark the trees that had been treated and to indicate any spilt herbicide. Approximately 5000 willows

were treated inside the Wollemi National Park from 2000 to 2003, and another 12000 treated outside the park from 2003 to 2006. The work off-park was split into sections and prioritised according to the risk re-infestation posed to areas already treated.

- **Follow-up monitoring** – Follow-up inspections confirmed that the willows were effectively killed and that other species had not been harmed. Many of the treated willows were left to naturally decay as they were not considered to be a significant risk to people or downstream infrastructure.
- **Rehabilitation through natural regeneration or revegetation with native species** – In most cases, treated areas were allowed to naturally regenerate from the remaining seed bank. At two sites, revegetation was required to ensure bank stability. Revegetation was conducted using long-stem native tube stock, grown from seed collected from the local area and propagated in a volunteer nursery run by Friends of the Colo.

Monitoring, evaluation and review

In December 2006, when the last mature female black willow trees were treated, members of Friends of the Colo toasted the end of primary willow control works with a bottle of champagne on the banks of the Colo. Monitoring trips are planned every two years to ensure that any seedlings missed can be treated before they get a chance to produce seed. In 2005, 100 seedlings and small trees were found and in 2007, 35 seedlings and small trees were found. The Friends of the Colo will continue to monitor the river for many years to come, to control any regrowth or reinvasion from other areas and to ensure that the willows are successfully



One person treats the willows, as the other records the location, along the Colo River. (Friends of the Colo)

replaced with native vegetation through natural regeneration or revegetation works.

A small stand of male trees remains on an unstable slope on private property. In consultation with the landholder, they will be gradually removed and replaced with appropriate native vegetation.

The Friends of the Colo continue to work on other significant weeds within the park, as well as willows.

Without the long-term commitment of these volunteers, willows could continue to invade and impact upon these precious environments.

To become involved with Friends of the Colo or Willow Warriors or for further information contact:

Willow Warriors Inc

10 Heather Close, Baulkham Hills NSW 2153

Phone: 0418 210 347

email: willowwarriors@optusnet.com.au

Internet: <http://tech.groups.yahoo.com/group/willowwarriors/>

Case Study 6

Partnerships and good management give a great result for the Bass River, Victoria



What and where?

The health of the Bass River in South Gippsland, Victoria, has been given a healthy boost thanks to a joint partnership between 14 committed landholders and the West Gippsland Catchment Management Authority (WGCMA). The WGCMA has been working to improve the health of waterways in the Bass Catchment since 1998. This project saw the removal of 14 km of willows, construction of 28 km of fencing and planting of 57,600 native tube stock along the river.

Why manage willows?

The Bass River drains the western end of the Strzelecki Ranges, forming a major tributary flowing into Western Port Bay. Extensive land clearance, agricultural development and infestation by willows have reduced in-stream habitat values and contributed to poor water quality.

Who to involve?

The project to remove willows was a joint partnership between 14 committed landholders and the West Gippsland Catchment Management Authority (WGCMA). The CMA funded the cost of the willow removal, site clean up, planting work and fencing material, while the landholders funded the construction of the fence and the tube stock required for planting. The CMA also helped to create an off-stream water source in cases where whole stream frontage was fenced off.

“The key to the success has been the strong project focus between all partners, including landholders, CMA and Landcare.”

Malcolm Gibson, Operations Manager,
West Gippsland CMA.

When and how to conduct the works?

A 20 tonne excavator and two qualified fellers worked together to remove dense willow stands at an average rate of 100 m per day. Trees were cut in situ, lifted from the river, stacked and then burnt. Stumps were poisoned using Roundup Biactive™.

The banks were raked with a stick rake mounted on the excavator and then hand raked to remove all remaining willow material. The site was then sown with a mix of rye grass and native tree tube stock. The grass was planted to help immediately stabilise the riparian zone until native plants established.

This project saw:

- 14 km of willows removed
- 28 km of fencing constructed, and
- 57,600 native tubestock planted along the river

BEFORE: Willow infestation along the Bass River



Monitoring, evaluation and review

West Gippsland CMA monitors each site twice annually in autumn and spring for two years following willow removal and covers the costs of any replanting, treatment of willow regrowth or other weed control required during this time. After this, the landholder is responsible for monitoring and maintaining their site.

In addition, WGCMA monitor the site for water quality and diversity of macro-invertebrates, before willow removal and for 8 years after, to ensure that the ultimate goal of improving the health of the waterway is being achieved.

After just one year of monitoring, they found that:

- 97% of native tubes planted had survived
- very little willow regrowth had occurred, and
- water quality and macroinvertebrate diversity in the river had markedly improved.

AFTER: willows removed from the Bass River



“Overall success is only achievable if all parties fully commit to the project, ensuring that maintenance targets are met and allowing time for the establishment of the vegetation in the riparian zone.”

Malcolm Gibson, Operations Manager,
West Gippsland CMA.

12 MONTHS LATER: fencing and revegetation completed, river health improved



(All photos: Mal Gibson, West Gippsland CMA)

Case Study 7

Community restoration of an urban creek in the ACT



What and where?

Restoration of a highly degraded creek has won the community around Yarralumla Creek a Keep Australia Beautiful Award and an improved area for all to enjoy. Yarralumla Creek is an urban stream in the ACT that drains the 35 square km Woden catchment. Since European settlement, the catchment has been impacted by land clearing and grazing but, over the past four decades, the effects of urbanisation have led to more extreme alterations, including changes to water flows, reduced water quality and less available habitat for native wildlife. A range of invasive pest plant species, including willows, have infested the river banks and are out-competing native vegetation.

Why manage willows?

The objective of this project was to improve the environmental and social values of Yarralumla Creek, including the public safety hazard and impact of willows, which had redirected flows, eroded the river banks and increased the transport of sediment downstream. As well as willows, a number of other issues needed to be managed, including limited creek access for recreation purposes, invasion by 'garden escapes', high velocity flows caused by concrete channels, pollutants from urban stormwater runoff and large amounts of human-created litter.

To succeed, the following key components would need to be addressed:

- Improve native habitat values by revegetating using a wide range of native species.
- Improve the watercourse structure and flows by undertaking revegetation and rock works.
- Raise community awareness about stormwater issues and the importance of riparian ecosystems.

- Improve water quality.
- Reduce gross pollutants from manufactured litter inputs.
- Improve safe access to the creek for passive recreation.

Who to involve?

The Molonglo Catchment Group and the Department of Urban Services worked jointly on the project with assistance from Canberra Urban Parks and Places, Conservation Volunteers Australia, the local community and the adjacent rural lessee.

To raise awareness of the creek's condition, the need to restore it and to encourage the community to take part in the project, a display was erected at a local workshop and media releases were distributed.

The campaign was embraced by the local community who joined in many activities, including pest plant control, revegetation, picking up litter, water quality monitoring and fencing. On Mothers Day, for example, about 320 people attended a planting day to commemorate their mothers, called 'Trees for Mum'.

Conservation Volunteers Australia teams became involved in planting, litter removal and woody weed control and additional weekend volunteer activities were carried out by the Molonglo Catchment Group.



Yarralumla Creek, before restoration May 2004 (Stefanie Straub, ACT Department of Territory and Municipal Services)



Yarralumla Creek, directly after restoration works June 2005. (Stefanie Straub, ACT Department of Territory and Municipal Services)

When and how to conduct the works?

The project's key activities included:

- **Removal of woody weeds, including willows** – All pest willows, selected poplars and other woody weeds were removed within and adjacent to the creek. The material that was cut down was mulched into wood chips and spread around the new plantings adjacent to the creek.
- **Revegetation with a wide range of native species to improve habitat and water quality and help stabilise the creek banks** – To date, over 15,000 plants have been planted, including macrophytes, grasses, shrubs and trees. While the very dry conditions enabled pest plants to be removed without damaging the creek banks, it made revegetation extremely difficult. At many planting sites, soil absorbents were needed to enable the water to penetrate the soil surface.
- **Litter removal** – In March 2005, 22 volunteers took part in Clean Up Australia Day in the area, where they collected 678 kg of rubbish. Ongoing litter collection is being carried out by the adjacent rural lessee.
- **Water quality monitoring and fencing off hazardous, eroded sections of creek.**

“For many years, Yarralumla Creek was not utilised. It was neglected and ridden with litter and the many willows present blocked access to the creek and created an unsafe environment. Now there is creek access, a walking track and an open, pleasant outlook that families can safely enjoy.”

Stefanie Straub, ACT

Monitoring, evaluation and review

Restoration of any natural landscape is a long-term activity and the Yarralumla Creek project will continue for a number of years. Active involvement of the community is helping to ensure the ongoing success of this project.

Revegetating the site with native species in 2005 has increased the available habitat for native animals, helped stabilise the banks and reduce erosion and improved the visual and recreational value of the area.

To further improve the area, future activities planned include:

- Continued follow-up weed control, litter collection, water quality monitoring and revegetation, including the re-establishment of pockets of native grasses where banks were left bare.
- Installation of erosion control structures, such as rock and Ecocells®, to stabilise the severely eroded sections of the creek.
- Developing formalised access points to specific areas along the creek for recreational purposes.
- Investigation of a proposal to install wetlands, bio-retention basins and litter traps up-stream of the creek to slow water flows and capture nutrients and litter.

In October 2005, the Yarralumla Creek Community Restoration Project won a Keep Australia Beautiful ACT Sustainable Cities Award in the Environmental Innovation category.