



**REVIEW OF PROGRESS TOWARDS THE
NATIONAL WILLOWS STRATEGIC PLAN
(2008 – 2009)**



Prepared by: Kelly Snell
National Willows Coordinator

Victorian Department of Primary Industries
PO Box 103 Geelong VIC 3220
kelly.snell@dpi.vic.gov.au

August 2009



CONTENTS

Executive Summary	1
Introduction	2
History and impact of willows in Australia	2
A national solution	2
Progress to date	3
Goals and achievements in 2008/2009	4
Goal 1: Stop the spread of willows	4
Goal 2: Manage existing infestations	8
Goal 3: Gain community support	15
Estimate of investment in willow management	18
Appendices	19
Appendix A - National Willows Taskforce members	19
Appendix B – References and publications for 2008/09	20
Appendix C – Change in awareness of the willow threat in regions across Australia	21
Appendix D: Statement of expenditure of funds for national coordination ..	22

EXECUTIVE SUMMARY

This report outlines progress made in 2008-2009 towards the National Willows Strategic Plan. In 1999, willows (*Salix* spp., except *S. babylonica*, *S. x calodendron* and *S. x reichardtii*) were listed as one of Australia's 20 Weeds of National Significance (WoNS) due to their highly invasive nature and impacts on stream and wetland hydrology, biodiversity and recreation. Although willows are listed as one of the 20 WoNS, there are in fact more than 30 naturalised willow taxa in Australia, making willows and their management complex. Willows can hybridise and spread long distances by seed across regions and States, making national coordination essential to effectively coordinate management between areas.

Outcomes achieved to date are the result of a range of actions undertaken over the past 4.5 years. These have been possible through substantial support from the Australian Government, seven state and territory governments, regional NRM bodies, community groups, research organisations, water authorities and local governments.

Stopping the spread of willows

An important step towards control of high risk (and potentially eradicable) outlier willow populations has occurred. Several regions of Western Australia and one region in Queensland have now recognised the importance of managing willows and have begun taking steps to address this problem. There have still been no records of willows or viable willow material being imported into Australia since the national program began.

Managing existing areas

Willows have always been a controversial weed to manage given their range of values and the short term effects of removing them. A potential biological control program for willows is no exception to this controversy. Recommendations have now been obtained that address potential conflicts of interest and provide a suitable way forward. Informed decisions can now be made to initiate the progression towards a biological control program. Critical information has also been gained on monitoring and evaluation of willow management, which will enable future analysis of current willow removal practices and measure how effectively they are achieving our willow and waterway management goals.

Gaining community support in managing the willow problem

Community understanding and support in managing the willow problem has increased by highlighting the nature and national significance of willows through the production and of the willows management DVD, 'A Way With Willows.' This will not only be a crucial resource to highlight the suite of control methods and how they apply to different situations but to also show the full process and long-term benefits of willow management.

Enormous momentum has been gained, clear outcomes are being achieved and our understanding of the complex nature of willows and their management is building. However, work is still required to fulfil the goals of the national strategy and to ensure sound, long-term, on-ground outcomes can be achieved beyond the life of the national program.

INTRODUCTION

This report outlines progress made in 2008-2009 towards the vision in the National Willows Strategic Plan: *To stop willows destroying our waterways and wetlands.*

The outcomes presented in this report are based on evaluation of activities undertaken over the past 12 months and are the result of a range of actions undertaken over the past 4.5 years.

History and impact of willows in Australia

Willows (*Salix* spp.) are among the most serious riparian and wetland weeds in temperate Australia. They infest thousands of kilometres of waterways and cause substantial economic and environmental impacts including reduced water quality and availability, increased erosion and flooding, reduced aquatic and riparian biodiversity and obstructed access to streams for fishing and aquatic sports. Willows have the potential to invade waterways, drainage lines, wetlands and other moist areas in all States and Territories. The largest infestations currently occur in NSW, the ACT, Victoria and Tasmania with smaller infestations in South Australia, Western Australia and Queensland.

Willows were originally introduced to Australia from Europe, Asia, North America and South America for basket making, cricket bat production, stream stabilisation, ornaments and shelter. Over 100 species, subspecies, varieties, cultivars and hybrids (all generically referred to as taxa) have been introduced and, of these, more than 30 have become naturalised in Australia.

Willows can spread by branches or seed sometimes up to 100kms in distance., highlighting the need for coordinated action across regions and States. The spread of some willows may appear slow for many years but given the right conditions, just a few adult willows could produce thousands of seedlings in just one season. Many willow taxa are capable of hybridising with one or more other taxa if they flower simultaneously and are near enough for pollination to occur. While some resulting hybrids may not flourish, some have become more invasive than their parents and there is the potential for strains to develop that are even better adapted to local conditions within Australia.

A national solution

In 1999, willows (except *S. babylonica*, *S. x calodendron* and *S. x reichardtii*) were listed as one of Australia's 20 Weeds of National Significance (WoNS). To help guide national coordination, the National Willows Strategic Plan was developed (ARMCANZ, ANZECC and FM 2001). This plan aims to deliver the following primary outcomes:

- Stop further spread of willows
- Manage the existing areas of willows
- Gain community support in managing the willow problem

A National Willows Coordinator was appointed in April 2005 and the National Willows Taskforce (see Appendix 4) was established in August 2005 in order to facilitate implementation of the Strategic Plan.

Progress to date has been made possible through substantial support from the Australian Government, seven state and territory governments, regional NRM bodies,

community groups, research organisations, water authorities and local governments across Australia. Significant contributions by the Australian Government, the Victorian Department of Sustainability and Environment, Melbourne Water and several Catchment Management Authorities has ensured a nationally co-ordinated approach.

Progress to date

Between 2001 and 2005, progress has been made at regional level, particularly in areas where serious infestations occur. The establishment of a National Coordinator and National Willows Taskforce in 2005, has seen a major increase in coordination between regions, states and territories in managing the willow issue.

From 2005 to 2006, the National Willows Coordinator and Taskforce conducted a progress review focused on building effective partnerships and networks across Australia, identifying research opportunities, communications and on-ground management priorities and developing major projects needed to address these priorities. Major projects and achievements up to 2008 include:

- ◆ Mapping and weed risk assessment of all willows across Australia which has improved our understanding of the invasiveness, impacts, present and potential distribution and set more effective priorities for the management of willows at all scales.
- ◆ Increased awareness of the willow threat through 29 workshops, training approximately 600 willow managers in identification and mapping of willow sawfly and creating cross-jurisdictional networks.
- ◆ Various research projects have contributed to a better understanding of willows and their management, including a survey of insects and pathogens associated with willows in Australia, understanding the management implications of the willow sawfly (an insect that has accidentally arrived to Australia and is causing significant damage to some willows) and genetic analysis of willow dispersal.
- ◆ Determining current best practice management of willows, developing and disseminating this knowledge to willow managers and others, including a national management guide and other education and extension resources
- ◆ Identification of outlier high risk seeding willow populations – including eradication programs for seeding willows in Tasmania and development of regional willow management plans for some regions in Victoria and New South Wales.
- ◆ No additional importation of weedy willows into Australia since the program began.

Some of the immediate outcomes of this work have become evident this past year and will be discussed further in the body of this report.

In 2005, Victoria, Western Australia and the Northern Territory joined the other five States and Territories in declaring willows as noxious weeds (the current legislative status of willows can be found at www.weeds.org.au/WoNS/Willows). In addition, protocols for managing commercial cricket bat willow plantations under permit were established in Tasmania (by Department of Primary Industries and Water) and New South Wales (by Department of Primary Industries).

GOALS AND ACHIEVEMENTS IN 2008/2009

Goal 1: Stop the spread of willows

Desired outcome: The spread of willows is halted

Key outcomes of 2008/2009

1. Continued development and implementation of regional and statewide extension and eradication programs.
2. Recognition of the need and first steps towards control of high risk (and potentially eradicable) outlier willow populations in Western Australia and Queensland.
3. No records of willows or viable willow material being imported to Australia in the past three years.

Future activities required

The acquired knowledge on willow distribution has been combined with weed risk assessment results and will enable a significant difference in the ability of regions and states to prioritise their willow management. Although our knowledge of willow management has substantially improved, significant gaps still exist. As a result we need to continue to develop this knowledge and adapt our priorities as it becomes available.

The following activities have been identified by the National Willows Taskforce as still being required to fully achieve this goal. A proposed time frame for the completion of each activity has also been given.

Short – medium term (next 1 - 2years):

- Make submission to AWC regarding recommendations for changes to WoNS listings based on weed risk assessment results and determine any changes required in the national policy on importation. Continue to monitor possible willow importation into Australia.
- Investigate ratings or prioritisation systems that have been used for other weeds and workshop an appropriate system for willows.
- Investigate development of an interactive web-based mapping database for storage of national datasets and use by willow managers.
- Determine and emphasize alternatives to willows.

Long term (next 2-5 years):

- All States to implement the recommendations made in the weed risk assessment report, including making relevant changes to legislation.
- Develop an ongoing, targeted training package for early detection and rapid response to new willow threats. If required, develop a submission to AQIS to effect changes in the national policy on importation of willows.

- Run “train the trainer” workshops to train state-based facilitators and enable states to run their own willow workshops.

Ongoing:

- Continue to improve our knowledge on willow distribution over time and adapt our priorities as new information becomes available.
- Encourage all regions to continue mapping new areas and update data in existing areas and feed this information back to the National Willows Program.
- Facilitate regions to continue to develop their willow identification skills, make use of willows workshop kits and run their own refresher mapping and identification training.
- Continue to raise awareness of willows through the promotion of current resource material and the development of new material that target priority species and areas defined in the weed risk assessment (including willow free areas).
- Continue active engagement with regional bodies in effective willow management.
- Continue to address emerging issues that may impede progress towards the national strategy.

Emerging issues

Willows have always been a controversial weed to manage, given their range of values and the short term effects of removing them. Two major issues emerged during 2006, which continue to promote planting and use of willows in 2008/2009:

1. *Natural Sequence Farming (NSF)* technique (Andrews, 2006). This approach promotes the values of willows but neglects willow impacts, their ability to readily spread and the scientific evidence to back this. The National Willows Taskforce visited Peter Andrews who developed the NSF concept in April 2008 to discuss the use of willows for NSF purposes. No resolution was achieved and there is still a way to go in addressing this issue.
2. *Biofuels*. Willows have been listed as a potential fuel and energy source in Australia and interest has been shown in a process used by New Zealand Company Biojoule, who are trialling willows to make ethanol. As a potential fuel and energy source or ‘biofuel’, (Low and Booth 2007) willows are also attracting great interest in the U.S.A. and Europe.

3. Progress on these issues during 2008/2009

1. A decision was made by the NWT not to progress the NSF issue until further notice. Funding has been invested by the Australian Government to research NSF and its broader application and until these results are available the NWT has decided not to become further involved in the debate. This approach will be reviewed by the NWT in 09/10.
2. The biofuels issue has quietened down over 2008/2009 and no apparent issues arose that required action by the NWT. However this issue will still need to be monitored and addressed in the future.

Analysis of key outcomes for 2008/2009

1. Continued development and implementation of regional and statewide extension and eradication programs

Highly invasive seeding willows have been identified as primary targets for eradication to prevent further spread by seed. Numerous programs are underway to tackle high priority seeding willows in different regions. The following examples provide an insight into achievements made during 2008/2009.

Eradication of seeding willows in Tasmania

This project focuses on the identification, mapping and eradication of naturalised highly invasive seeding pussy willow populations in Tasmania. The project conducted by Tasmanian Land and Water Professionals, has now ceased due to an end of funding from Defeating the Weed Menace program. Significant in-kind support was received from local government, regional NRM boards, Department of Primary Industries, Parks, Water and Environment and private industry. Seeding willows have now been controlled at 250 sites across Tasmania, including monitoring and follow-up control.

A final report has been completed for the project which includes a number of recommendations for future works required. The on-ground works are prioritised by site and level and timing of control required and maps are provided to locate each site. The report provides a detailed future direction and prescription for action to continue the efforts to address the seeding willow issues across Tasmania.

It has become apparent throughout the life of the project that seeding willows may not be eradicable from Tasmania and containment may be the better state-wide approach. However there are still key outlier sites where these willows could be eradicated at a regional or local level, thus dramatically reducing the containment area for these highly invasive willows at the state level. One such example where these achievements could be made is eradication of *S. cinerea* from Bruny Island.

Control of grey willow in the Onkaparinga Catchment, South Australia

This project has been working towards eradication of two main infestations and a scattering of small stands of the high priority seeding willow grey willow (*Salix cinerea*) in the Onkaparinga Catchment in South Australia. Funding and in-kind support has been provided from the Defeating the Weed Menace program, Department of Water Land and Biodiversity Conservation and Adelaide and Mt Lofty Ranges Natural Resource Management board (AMLR NRM).

Mapping and treatment have occurred at priority sites and some treated sites have now moved into their 2nd year of revegetation. The AMLR NRM will continue to treat some sites over 2009/10, focussing on those sites where priority to manage, matches the level of community support. Increasing community understanding of the impact of willows and emphasising the long-term benefits of their management will be an important step to increase the level of landholder support for this program.

2. Recognition of the need and first steps towards control of high risk (and potentially eradicable) outlier willow populations in Western Australia and Queensland.

Steps to take action against outlier and high risk willows previously identified in Western Australia and Queensland have been taken in several NRM regions. The threat of willows and need for action has been recognised and acted upon in Western Australia by the South West, South Coast, Avon and Swan Regional NRM Groups. Willows were targeted for control in a 'Caring for our Country' multi-regional bid to protect the south-west biodiversity hotspot from the impact of all WoNS. A similar project was submitted by Queensland Murray-Darling Committee Inc. to address WoNS management priorities in Southern Queensland, including a component to manage outlier willows.

Although neither of these bids were successful, it is important to note that the willow threat has been acknowledged and addressed through the bids and there is support and opportunity for control to occur in these regions. Further work will be required to ensure on-ground control of these outlier and high risk infestations does eventuate.

3. No records of willows being imported to Australia in the past 4 years.

A report was obtained from the Australian Quarantine and Inspection Service on the importation of willows from Israel or the USA since 1st January 2002. The most recently recorded importation of willows into Australia was on the 7th October 2005. Between 2002 and 2005 there were 10 records of willows imported to Australia, nine from Israel and one from the USA. Eight of these were imported to Victoria and two were imported to NSW. By the end of 2005, willows were listed as noxious weeds in all States and Territories. Since then, no viable willow material has been imported to Australia. AQIS noted however, that they cannot guarantee that willows have not been imported under an incorrect Tariff code or a misleading description.

Goal 2: Manage existing infestations

Desired outcome: Willows effectively managed

Key outcomes of 2008/2009

1. Publication of comprehensive guidelines on willow management objectives, strategies and control methods - Development of a willow management DVD - 'A Way With Willows'
2. Assessing and improving methods of control through research and development activities.
3. A clearer understanding of the biology, ecology, distribution and impact of key willow taxa.
4. Continued suppression of invasive willows through the development and implementation of active management programs

Future activities required

The following activities have been identified by the National Willows Taskforce as still being required to fully achieve this goal. A proposed time frame for the completion of each activity has also been given.

Short – medium term (next 1-2 years):

- Complete commissioned review of the National Willows Strategy and develop a program logic.
- Facilitate action to target outlier and high risk seeding willow infestations in Western Australia, Queensland and Tasmania.
- Increase the development (and implementation) of willow management plans at regional level, including ensuring weed risk assessment results are recognised in these plans to address high priority willows in each region.
- Further progress investigations into the biological control of willows and continue research to understand the willow sawfly.
- Continue research into willows and water use.
- Hold a second research forum and to re-ignite direction for willows research and evaluate outcomes from previous forum.

Long term (next 2-5 years):

- Progress development of monitoring and evaluation guidelines to ensure sound scientific evidence can be used to analyse ecological impacts of willow management and improve outcome reporting.
- Improve riparian rehabilitation practices. Review and refine best practice guidelines, including national willow practitioner workshops.
- Where needed, develop protocols for the management of cricket bat willow plantations, particularly in Victoria.

On-going

- Measure progress against benchmark maps through changes in awareness and by updating willow maps with new infestations and control efforts.
- Encourage all regions to continue mapping new areas, confirm records of different willow taxa and update data in existing areas and feed this information back to the National Willows Program.

Change in direction of strategy

Strategy 2.2.6 identifies the need to enforce eradication and control of priority species. The National Willows Taskforce believes that enforcement should only be conducted in areas where lack of voluntary compliance threatens a specific control program. In general, the national program aims to focus on education rather than enforcement. The results of the weed risk assessment can now support decisions and encourage legislative review where needed.

Strategy 2.2.2 identifies the need to develop regional plans based on a generic willow management model. It is believed that a generic model is inappropriate given the complex nature of willow and riparian management and the variations in biology, spread and impacts of different willow taxa. To address this issue, the principles of planning and conducting a willow management plan are included in the national management guide to assist people in developing regional management plans. It is the intention to encourage development and implementation of willow management plans.

Analysis of key outcomes for 2008/2009

1. Publication of comprehensive guidelines on willow management objectives, strategies and control methods - Development of a willow management DVD - 'A Way With Willows'

One of the key issues highlighted throughout development of the National Willows Management Guide in 2007 (Holland Clift and Davies 2007) was the difficulty in adequately explaining different management techniques and showing the complexities and possible dangers of willow management in a written format. The National Willows Taskforce therefore secured funding and began to plan and develop a DVD to visually demonstrate techniques and situations outlined in the manual. The DVD was funded through Defeating the Weed Menace and developed by Flickchicks, supported by the Department of Primary Industries, Victoria. Significant in-kind contribution was received from Southern Rivers, Central West, West Gippsland and North East CMAs, Melbourne Water, Orange City Council, Willow Warriors, Mersey NRM. It was released in June 2008.

The DVD was urgently needed as an education resource for new willow managers to demonstrate the complexities of practical on-ground willow management and in particular highlight that the effectiveness and cost of different control techniques that vary significantly across Australia, depending on the operator's skills and experience. It was also urgently needed in areas where there is community resistance to willow management, to clearly demonstrate the process and long-term benefits of good management programs.

Footage was taken of all aspects of willow management in a range of different climatic zones. This included monitoring, follow up maintenance, revegetation works and post-removal footage taken in areas where control was undertaken 1, 3 and 5 years ago. Footage was also taken of areas where problems have occurred illustrating the risks of willow management and 'what not to do'.

The support received from willow managers and organisations across Australia was enormous. Eight regional and volunteer organisations took the lead to help organise filming in their areas with over 50 different faces appearing throughout the film and many more involved behind the scenes. Filming commenced in September 2008 and was completed in December 2008. Filming occurred across south-eastern and central New South Wales, including locations at Berrima, Bowral, Mossvale, Cooma, Nimmitabel, Bredbo, Bathurst and Orange. Filming also occurred in northern Tasmania, at Cressy, Penguin and Don, and across north east and south eastern Victoria including locations around Wodonga, Bunyip, Tarago, Maffra, and Leongatha.

450 copies of the film have been distributed thus far generating incredibly positive feedback. The DVD will be a crucial resource for existing willow managers (to learn new techniques or to use themselves as a resource to show newer willow managers); for new willow managers who can see the suite of control methods and how they apply to different situations and for those opposed to willow management to see the full process and long-term benefits of what we are trying to achieve. This resource will go a long way towards achieving greater coordination and success for willow management in Australia.

A short preview of the film can be viewed at www.weeds.org.au/WoNS/willows

2. Assessing and improving methods of control through research and development activities

a) Long term monitoring and evaluation of willow management in rehabilitation areas – will current practices achieve desired goals in the management of willows and the associated waterway.

There is significant investment in willow management however, the long term benefits of willow reduction to the stream and riparian environment is relatively unknown. There has been limited evaluation of whether these desired outcomes are being achieved, particularly those relating to improved river health. This makes it difficult to confidently determine the effectiveness of investment in willow management.

This gap was identified as one of five high priority national research projects at the National Willows Research Forum in February 2007. In recognition of this, a project to develop consistent national monitoring and evaluation guidelines for willow management projects was initiated by the National Willows Taskforce. The first stage of this process, completed over 2008/2009, was to gain critical information to determine the extent of current monitoring and the barriers which currently limit monitoring and evaluation activities.

An on-line survey was distributed to willow managers in all states and territories to seek information. Responses to the survey were received from 32 different

agencies including both community and professional agencies and covered five states and territories. Critical information has now been obtained on:

- current willow management
- current monitoring and evaluation
- use of monitoring information
- barriers to monitoring; and
- current available monitoring guidelines

A report has been completed (Ede, 2009) capturing this information and making recommendations for progression. As a result of this work we have been able to create a snapshot of the different methods, uses, partnerships and barriers to willow management across Australia. This information will help progress further stages towards understanding the impact of willow management and the effectiveness of investment.

b) The biological management of willows - recommendations have been sought for a suitable way forward that will reduce conflicts of interest.

Biological control of willows has been identified as high priority by both the National Willows Taskforce and at the National Willows Research Forum in February 2007. Biological control of willows has been discussed for a number of years but until now had not progressed beyond a literature review.

Funding was successfully obtained from the Victorian Department of Sustainability and Environment and the ACT Department of Territory and Municipal Services to complete an options paper looking at willow taxa that may be suitable for a biological control program. The Victorian Department of Industries completed the project with in-kind contribution from regional willow managers, industry bodies (such as cricket bat and nursery), and state/territory Government representatives.

The options paper was required to address a number of conflict of interest issues relating to willows. These issues are mostly related to the value of willows such as heritage, community/amenity and commercial values. The paper provides recommendations for a suitable way forward specifying sets of willows to consider first for biological control targets and proposes the method for proposal of willows for biological control. This paper has paved the way to enable the National Willows Taskforce to make informed decisions to initiate the process towards the progression of a bio-control program.

c) Willow sawfly – an increased understanding of the distribution of willow sawfly and its impact on willow management.

The Department of Primary Industries Victoria has continued to conduct research on the willow sawfly (*Nematus oligospilus*) in Victoria, with funding assistance from Melbourne Water, the Department of Sustainability and Environment and significant in-kind contributions from Parks Victoria, the North East Catchment Management Authority (CMA) and several other Victorian CMAs.

Sawfly is well established across south-eastern Australia and continues to extend its range. Tree defoliation has occurred at numerous sites over a number of seasons however, no tree deaths have been recorded to date as a result of the sawfly. A new

report of the sawfly in WA during 08-09 was found in someone's backyard and suspected to be off a campervan that been driven across the Nullarbor. No further reports occurred in WA although further awareness raising of the sawfly is required to determine whether this report was in fact a one-off or whether sawfly is found in other areas of WA. The affect that willow sawfly is having on willow populations is still unclear and we need to continue this research to gain further knowledge.

Another set of trials being conducted by the Department of Primary Industries Victoria is testing the likelihood of success in establishing native riparian species under willow trees which have been defoliated by willow sawfly. Tube-stock have been planted in plots at all three sites in Victoria and direct seeding has occurred at two of these sites. Assessments of seedling height and health were made in autumn 2009 and so far results have been variable. Further assessments are to be made in Spring 2009 with the project hopefully providing further information on how the willow sawfly may impact willow management.

3. A clearer understanding of the biology, ecology, distribution and impact of key willow taxa.

- a) *Tracking seed and pollen migration using genetic markers - significant improvement of our knowledge of the reproductive ecology and dispersal dynamics of willows.*

PhD research project is underway to understand the extent and pattern of seed and pollen migration across the landscape using genetic markers. This research is being conducted by CSIRO Plant Industry, with funding assistance from the Department of Sustainability and Environment and Melbourne Water and in-kind contributions from several Victorian Catchment Management Authorities, the Australian National Botanic Gardens and the Australian National University.

Progress in the last 12 months (Hopley, unpublished) has shown that:

- *Salix cinerea* maintains high levels of genetic variation and there is sufficient genetic diversity within and among populations for successful assignment of seed and seedlings to source populations across the study catchment.
- Significant levels (18%) of inter-population pollination events are occurring at the study sites suggesting that inter-population dynamics are critical to local willow reproductive dynamics.
- Wind pollination can only account for 10-15% of observed seed set events, with insect pollination required to maintain typical levels of open-pollinated seed set.
- Seed production is generally very high, with millions of seed produced even at the smallest populations.
- Seed have a very short period of viability with less than half being viable after three weeks and almost zero percent viable after seven weeks.

These results significantly improve our knowledge of the reproductive ecology and dispersal dynamics of willows. The project is due to be complete in late 2009.

Application of such knowledge has implications for on-ground willow management as it can help us better understand where to set management priorities to control seeding willow populations at the landscape scale.

- b) *Research on the water use of willows compared to other vegetation – improved understanding of the water use of willows and their potential impacts on our water resources.*

Another national high priority research project identified at the National Willows Research Forum has been water use of willows. Ensis (an unincorporated joint venture between CSIRO and New Zealand forest research group Scion) with funding assistance from Water for Rivers have conducted trials in south central New South Wales (Doody *et al.* 2006) to determine water use of weeping willows (*Salix babylonica*) compared to other vegetation. Results from 08-09 show further increases in potential water savings from previous years. This saving can be up to 5.5ML/ha-1 of projected willow canopy area if the willow being removed is situated in the stream bed with permanent access to water.

Another comparative study of willow and riparian vegetation has recently begun in the Ovens Valley in Victoria. This study is measuring tree water use in three willow taxa – *S. fragilis*, *S. nigra* and undetermined taxa. This research will make water savings estimates based on willows other than *S. babylonica* and results from both studies will enable a model to be developed that could infer potential water savings from willow removal.

4. Continued suppression of core infestations of invasive willows through the development and implementation of active management programs

Several regions have conducted significant planning (including detailed mapping) to ensure that willow management is undertaken in a strategic manner. The South Australia Murray Darling NRM Board has started developing a willow management plan and Victoria's North East CMA is now implementing their willow management plan.

A collaborative approach to willow management

A collaborative approach to planning and implementing strategic willow management is highlighted through Parks Victoria's program to protect the Bogong High Plains. This need was recognised after grey sallow (*Salix cinerea*) seedlings began invading the alpine wetlands after the 2003 bushfires. On-ground works have so far targeted parent populations of *S. cinerea* to ensure spread is reduced within high value alpine bogs. This project is a collaborative approach to protect the Bogong High Plains with the North East CMA and Department of Sustainability and Environment and includes on-ground works targeting potential sources of willows in the Kiewa Valley. Funding through 'Caring for our Country' will enable this work to continue in 09-10, focussing on removing parent willows to prevent spread from the North East into high value bogs in Gippsland.

Decision models are also being trialled to assist staff at Parks Victoria to develop a control strategy that will result in the efficient and effective control (or eradication) of willow in alpine bogs on the Bogong High Plains. Initial modelling suggested that concentrating on the seedling populations was the best strategy if the aim was to protect the bogs from infestation; this also appeared to be the most cost-effective option. Further work has been conducted over 2008-09 to measure estimates for the

cost-effectiveness of different control options. To address the prioritisation of control across the Bogong High Plains, Parks Victoria funded an honours project (July 2008-July 2009). From this project a species distribution model has been developed (and validated) to predict the distribution of willow seedlings on the Bogong High Plains.

Major control programs

Major control programs have continued in core willow affected regions across Victoria and NSW with a focus on asset protection and rehabilitation of streams and wetlands. Smaller control programs are being conducted across Tasmania, northern NSW, central and western Victoria, eastern South Australia and in the ACT.

The West Gippsland CMA in Victoria has managed a total of 28.75kms of rivers for willows during 08-09, the equivalent of 51ha. These works include the Tarra River, where 2.5km of willow reduction occurred, 5.4kms of fencing was constructed leaving an average of 10m riparian zone and 4800 native seedlings were planted using tubestock. This site was selected for willow management by the CMA as it is a priority reach identified under their regional River Health strategy. The works at this site over 08-09 mean that 98% of the total river system has now been rehabilitated with only three properties remaining to be completed. Works have aimed at improving water quality, biodiversity and habitat values within the high value system.

There has been much on-ground activity in the Upper Murrumbidgee Catchment (ACT/NSW) with ongoing projects continuing along the Queanbeyan and Yass Rivers by the Murrumbidgee CMA, local council and local Landcare groups. Other works have also been conducted along the Molonglo River by both the ACT Government and a Commonwealth Government funded project called the "Molonglo River Rescue". An updated willow management strategy for the catchment has been developed and is due for release shortly. This strategy will include actions plans for sub-catchment areas that can be used by community members, as well as updated information of willows and relevant research.

The Namoi CMA in northern NSW have recently began recognising willows as a problem and willows are now one of the top twenty priority weeds in Namoi. During 08-09 willow removal and restoration works were completed along the Namoi River in the Manila township. This was completed at the high profile site as an educational project to demonstrate the benefit of willow management to the local community and encourage further willow management activity. An application with Central West and Border Rivers CMAs went into 'Caring for our Country' for a landscape scale project focussed on willows and river health however, this was unsuccessful. Further investment in willow management will be on a site by site basis. Other long-term on-ground willow management programs are continuing in other CMAs across NSW, including both Southern Rivers and Central West CMAs, whose programs and works both feature in the 'A Way With Willows' DVD.

Goal 3: Gain community support

Desired outcome: Increased community support

Key outcomes for 2008/09:

1. Highlighting the nature and national significance of the willow problem and improving access to willow information.
2. Presenting and implementing solutions to the willow problem through identifying and encouraging management options via current research projects and highlighting successful willow management through distribution of a national management DVD.
3. Increased investment in cross-border strategic willow management programs by organisations across Australia.

Future activities required:

The following activities have been identified by the National Willows Taskforce as still being required to fully achieve this goal. A proposed time frame for the completion of each activity has also been given.

Short – medium term (next 1-2 years):

- Develop a willow management brochure to compliment the national willows management guide.
- Re-print willows weedeck, an essential resource for willow managers when identifying willows for mapping and management.
- Conduct regional roadshows to ensure weed risk assessment results are recognized by all affected regions and encourage good work to continue.
- Document current alternatives to willows for various scenarios and conduct further research to develop additional alternatives.

Long term (next 2-5 years):

- Develop new willow extension resources in line with priorities for willow management and recommendations from developing willow management priorities from the local to the national level report (Steel *et al* 2008)

Ongoing:

- Continue to develop proposals and identify potential sponsors consistent with the investment goals of regional and state-wide organizations.
- Continue to distribute willow resource materials.
- Continue to strengthen regional partnerships, particularly with public land managers.

Analysis of key outcomes for 2008/2009

1. Highlighting the nature and national significance of the willow problem and improving access to willow information

Through a National Willows Survey conducted in 2005/2006, respondents indicated that their preferred method of receiving advice and information were brochures, management manuals, website access, field days/shows and email. The National Willows Program has therefore focused on these methods of communication during 2008/2009.

- **A Way With Willows DVD:** as mentioned in goal 2 above, this national management DVD has been produced with over 450 copies distributed so far. The DVD was launched in front of 80 waterway managers at the Waterway Field Staff Conference in Wangaratta, Victoria during May 2008. The film also featured in a workshop on willow management techniques at this conference.
- **Developing willow management priorities toolkit:** this toolkit continues to be distributed to willow managers in all willow affected regions, particularly to those developing willow management strategies.
- **Website:** all resources of relevance to the National Willows Program have been posted on the willows webpage on the Weeds Australia website, including an updates of funding priorities for use by managers under 'Caring for our Country.' See www.weeds.org.au/WoNS/willows.
- **Email:** the National Willows Network, Taskforce and Research e-groups continue to be actively used for promotion of new information and updates. A highlight of using these networks was doubling the amount of respondents for the monitoring and evaluation survey project (Ede 2009).
- **Conferences:** willows and the WoNS program were promoted through displays and dissemination of brochures, management guides, resource kits and banners at field days and conferences. A highlight was a presentation of the developing willow management priorities toolkit at the Tasmanian Weeds Society Conference in October 2008. This resulted in ground-truthing of reported willows in the South West wilderness area. Willow impacts and management were also promoted in Victoria at the Elmore and Bairnsdale Field Days and a 2 week weed awareness display at the Castlemaine Library.

2. Presenting and implementing solutions to the willow problem

Management options have been identified and encouraged via current research projects and the development of the willows DVD as outlined in goals 1 and 2.

3. Increased investment in cross-border strategic willow management programs by organisations across Australia

Significant cross-regional projects have been made possible through funding assistance from the Defeating the Weed Menace Program, including the state-wide eradication of seeding willows in Tasmania.

The Victorian Department of Sustainability and Environment (DSE) and Melbourne Water have provided significant investment into state-wide research projects being conducted by the Department of Primary Industries and CSIRO. In addition, the DSE along with the ACT State Government committed seed funding to complete the biological control option paper for willows in Australia.

Caring for our Country

Significant effort was put in under the 'Caring for our Country' program to facilitate collaboration among regions to ensure applications addressed national willows priorities. A large amount of time was spent by the national coordinator on this and a large number of competitive applications involving willows were submitted by regional NRMs and community groups.

A large number of projects that addressed national willows priorities were submitted however many were unsuccessful. Two of these projects addressed high priority national actions to eradicate high risk outlier willow populations:

- Western Australia - Warren Catchments Council (on behalf of the South West, South Coast, Avon and Swan Regional NRM groups) - 'Protecting Western Australia's south-western biodiversity hotspot from Weeds of National Significance'. Including control of outlier and highly invasive willows that threaten Ramsar wetlands.
- Queensland – Qld Murray-Darling Committee Inc. 'Addressing Weeds of National Significance management priorities in Southern Queensland'. Including on-ground component to remove national outlier willow populations.

An analysis of all successful projects on the 'Caring for our Country' website shows that only three projects specifically list willow control as an activity. Two of these projects have been funded via the landcare component and include one in New South Wales and one in South Australia, totalling just under \$350,000. The third project that specifically mentions willows is a part of the East Gippsland CMAs base level allocation. There are no projects under the competitive funding that specifically list willow activities. However, as only summary information is available it is expected that numerous projects that include WoNS in general or river rehabilitation may and will include further willow management activities.

Estimate of investment in willow management

It is difficult to obtain accurate data on investment in willow management as good projects will have multiple actions that lead to broader outcomes, such as complementary river rehabilitation activities and water quality monitoring. This makes extracting funding directed specifically to willow management difficult. Based on a survey conducted in 2006 (Davies and Holland-Clift 2007), initial willow control on average constitutes just over half the costs associated with willow management, with follow up control and rehabilitation constituting most of the remaining funds. In addition, the cost of initial control decreases considerably with decreasing density, with large infestations costing over 5 times more than scattered stands per kilometre and scattered stands costing 16 times more than individual trees.

No estimate could be obtained from the Australian Government for their investment in willow management activities for 2008-09.

Estimates for other contributions in willow management are especially difficult to determine given the plethora of organisations and groups active in willow management across Australia. No data was specifically collected as valid comparisons with Australian Government investment could not be made. The investment for 07/08 was close to \$20M and it is expected that 08/09 investment would be much the same as most programs have continued as normal.

APPENDICES

Appendix A - National Willows Taskforce members

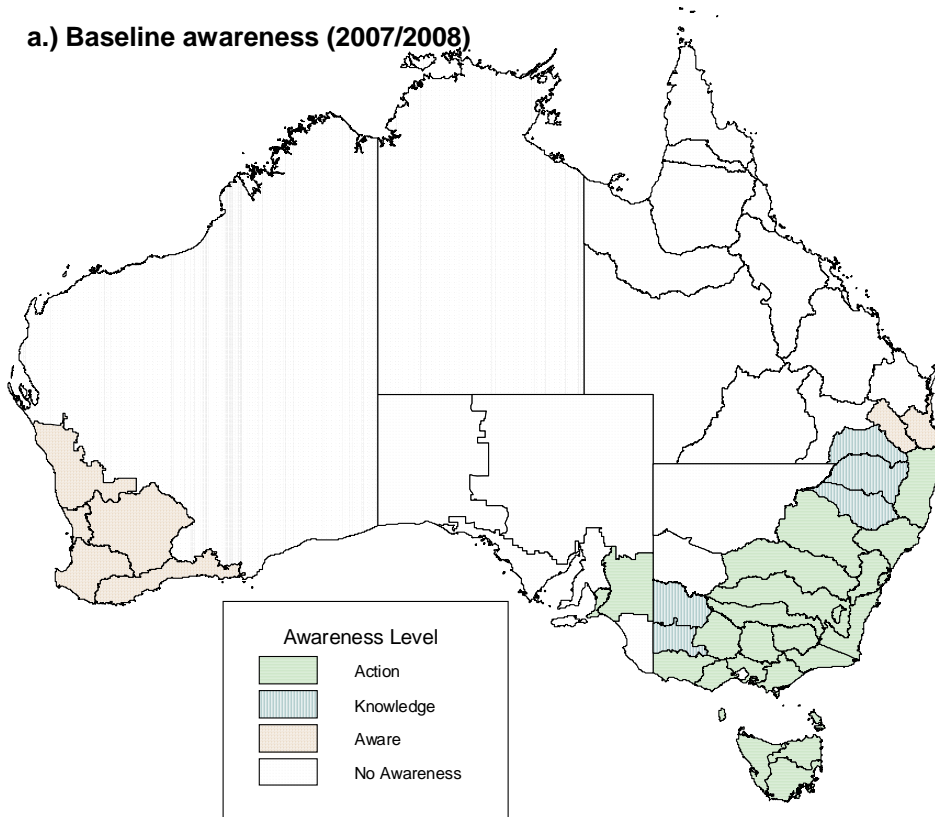
Members	
Community Chair – Drew English Regional Manager, Conservation Volunteers Australia ACT and southeast NSW branch	ACT State Government – Stefanie Straub Acting Manager Environmental Management, Parks and Places
Community Representative – Jeff Cottrell Chair, Willow Warriors Inc.	SA State Government – Shauna Potter WoNS Coordinator, Department of Water, Land and Biodiversity Conservation
Natural Resource Management Regions – Malcolm Gibson Operations Manager, West Gippsland CMA, Victoria	Vic State Government – Ruth Myers Policy Officer, Pest Plants, Department of Primary Industries
Community/research – Eligio Bruzzese Retired Research Director - weeds	NSW State Government – Sydney Lisle State Weed Control Coordinator, Department of Primary Industries
National Coordinator – Kelly Snell Department of Primary Industries Victoria	Tas State Government – Kiowa Fenner Regional Weed Management Officer, Department of Primary Industries, Parks, Water and Environment
Corresponding members (receive all correspondence, but are not required to attend all meetings)	
NSW Local Government – Paula Bosse Riverina Noxious Weeds Project Officer, Eastern and Western Riverina Noxious Weeds Advisory Groups	WA State Government – Greg Keighery Principal Research Scientist, Department of Environment and Conservation
Nursery and Garden Industry – Robert Chin & Rebecca Dawson Nursery Industry Development Officer, Nursery & Garden Industry Victoria	National Weeds Management Facilitator – John Thorp, Ex officio
Australian Government – Position to be filled	QLD State Government – Position to be filled

Appendix B – References and publications for 2008/09

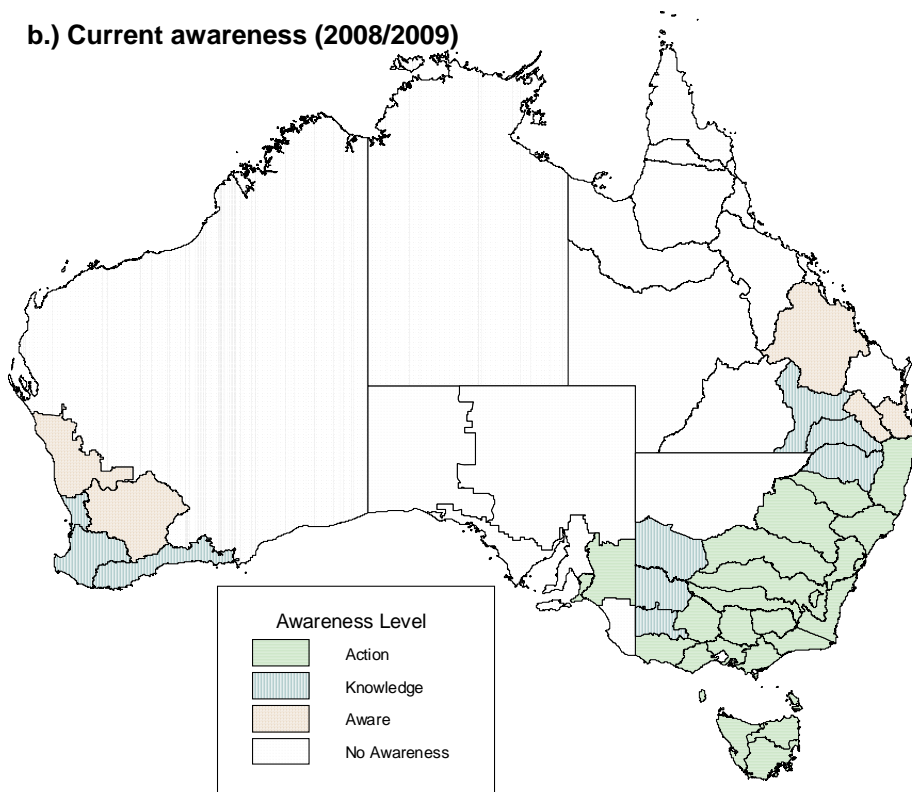
- Andrews, P. (2006). *Back from the brink*. Australian Broadcasting Corporation, Sydney.
- Davies, J. and Holland-Clift, S. (2007). *National Willows Survey: Techniques and Costs of Willow Management*. Department of Primary Industries, Victoria.
- Ecology Australia (2009). Fainter Ridge Willow Infestation Assessment. Report prepared for Parks Victoria. Ecology Australia Pty Ltd Fairfield.
- Ede F. (2009). *Monitoring and Evaluation of Willow Management – Stage One: Report of Current Practices in Australia*. Department of Primary Industries, Victoria.
- Holland Clift, S. & Davies, J. (2007). *Willows National Management Guide: current management and control options for willows (Salix spp.) in Australia*. Department of Primary Industries, Geelong, Victoria.
- Hopley T. (unpublished). *Progress Report 3, March 2009: Genetic Analysis of Willow Dispersal in Victoria*. CSIRO Plant Industry.
- Low, T. and Booth, C. (2007). *The Weedy Truth About Biofuels*. Invasive Species Council, Melbourne.
- Steel, J. Holland Clift, S. & Snell, K. (2008). *Developing willow management priorities from the local to the national level*. Department of Primary Industries, Victoria.
- Steel J Mitchard B, Mahr F (2008). *The current and potential distribution of willows (Salix spp.) in Australia An ArcGIS 9.2 Project*. Department of Primary Industries, Victoria.

Appendix C – Change in awareness of the willow threat in regions across Australia

a.) Baseline awareness (2007/2008)



b.) Current awareness (2008/2009)



Appendix D: Statement of expenditure of funds for national coordination

Please note: there are two statements of expenditure. These reflect the fact that there were two contracts to report on for willows national coordination during the 08/09 financial year.

First Statement of expenditure of funds: 1 JULY 08 – 30 APRIL 09

1 July 2008 – 30 April 2009		Planned budget		Actual Expenditure	
Salary and on-costs		Recipient's Contributions (without GST)	Funds be paid by the C'wealth (without GST)	Recipient's Contributions Expended (without GST)	C'wealth Funds Expended (without GST)
Co-ordinator salary and on-costs			88,096		52,035 [^]
National Willows Taskforce Members		42,986		50,917	
Management, admin, comms, research, NRM groups, state/territory, community support & inputs (inc salary input for projects listed below)		67,431		29,667	
Scoping report for monitoring and evaluation of willow removal programs nationally		0		9,503	
A	Total employment costs	110,417	88,096	90,087	52,035
Operating Cost Items		Recipient's Contributions (without GST)	Funds be paid by the C'wealth (without GST)	Recipient's Contributions Expended (without GST)	C'wealth Funds Expended (without GST)
National Coordinator Operating Expenses		4,023	14,946	1,250	12,400
Communication (publications, including national willows research forum and willow sawfly)		20,000	17,500	51,667	0*
Contribution to willows biocontrol options paper		8,000 (cash)	0	44,333	0
Scoping report for monitoring and evaluation of willow removal programs nationally		18,000	25,000	0	0**
National Willows Taskforce Operating		15,000	13,916	7,167	8,143
B	Total Operating costs	65,023	71,362	104,417	20,543
C	Total Cost (without GST) (A+B)	\$175,440	159,458	194,504	72,578
D	GST (10%)	17,544	15,945	19,450	7,257
E	Total Cost (including GST)	\$192,984	\$175,403	213,954	79,835

[^]Underspend due to a salary profiling lag due to changeover of project managers whilst willows coordinator was on secondment. Spending of these funds was rectified after April 09 and therefore appears during period of 08-09 deed. Both 07-08 amendment deed acquittal and 08-09 deed acquittal should be viewed together for an accurate picture of funds spent for willows coordinator. *National Research Forum postponed for reasons stated in final performance report. **Project nearing completion and payment is to be made in June 09.

Second Statement of expenditure of funds: 1 MAY – 30 JUNE 09

1 May 2009 – 30 June 2009		Planned budget		Actual Expenditure	
Salary and on-costs		Recipient's Contributions (without GST)	Funds be paid by the C'wealth (without GST)	Recipient's Contributions Expended (without GST)	C'wealth Funds Expended (without GST)
Co-ordinator salary and on-costs			17,620		64,151*
National Willows Taskforce Members		8,843		10,183	
Management, admin, comms, research, NRM groups, state/territory, community support & inputs		28,381		5,934	
Scoping report for monitoring and evaluation of willow removal programs nationally (carried over from 07-08)				1,901	
A	Total employment costs	\$37,224	17,620	18,018	64,151
Operating Cost Items		Recipient's Contributions (without GST)	Funds be paid by the C'wealth (without GST)	Recipient's Contributions Expended (without GST)	C'wealth Funds Expended (without GST)
National Coordinator Operating Expenses		1,000	4,257	19,400	2,504
Scoping report for monitoring and evaluation of willow removal programs nationally (carried over from 07-08)					25,000**
National Willows Taskforce Operating		3,000	3,583	1,433	0
B	Total Operating costs	4,000	7,840	20,883	27,504
C	Total Cost (without GST) (A+B)	41,224	25,460	38,901	91,655*
D	GST (10%)	4,122	2,546	3,890	9,165
E	Total Cost (including GST)	45,346	28,006	42,791	100,820

*Overspend was from a salary profiling lag due to changeover of project managers whilst willows coordinator was on secondment. Spending of these funds was rectified after April 09 and therefore appears during period of 08-09 deed. 07-08 amendment deed acquittal and 08-09 deed acquittal should be viewed together for an accurate picture of funds spent for willows coordinator. **Project was part of 07-08 amendment deed, however payment and finalisation of project occurred during this deed.