



WILLOW MANAGEMENT STRATEGY FOR THE UPPER MURRUMBIDGEE CATCHMENT

Produced in collaboration by:

- *Willows Working Group of the Environment Advisory Committee*
- *Willows Working Group of the Upper Murrumbidgee Catchment Management Committee*

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1. ACKNOWLEDGEMENTS

The Environment Advisory Committee and the Upper Murrumbidgee Catchment Management Committee Willows Working Groups worked collaboratively in the development and production of this Strategy.

The cooperative approach between the two Groups enabled broad involvement and representation from the following organisations:

- Conservation Council of the South East Region & Canberra
- Forestry C.S.I.R.O
- Greening Australia
- NSW Department of Land & Water Conservation
- Environment ACT, Department of Urban Services
- City Operations, Department of Urban Services

Advice from 17 community organisations was also received through a submission process and assisted in the preparation of this Strategy, these included:

- Department of Business, the Arts, Sport and Tourism (ACT Heritage);
- NSW Department of Land and Water Conservation;
- Greening Australia ACT & SE NSW (Inc.);
- Department of Forestry Australian National University;
- ACT Electricity and Water;
- Canberra Jet Sports and Boating Association;
- Bungendore Community Landcare Group;
- Department of Urban Services (Planning and Land Management);
- Murray-Darling Basin Commission;
- Umbagog Park Landcare Group;
- ACT, Monaro and Riverina Branch of the Australian Garden History Society;
- Department of Urban Services (Canberra Urban Parks);
- Upper Murrumbidgee Catchment Coordination Committee;
- Department of Urban Services (Environment ACT);
- Rural Lessees Association;
- National Parks Association of the ACT; and
- National Trust of Australia (ACT).

The Working Group would like to thank these organisations for their contribution to the Strategy. Particular thanks goes to Geoff Butler and Val Wiseman for their work in compiling this Strategy.

3. RECOMMENDATIONS

1. SPECIES WHICH SHOULD BE THE SUBJECT OF A MANAGEMENT POLICY.

(a) A list of species contributing to seed production, or known to be invasive, as per Appendix 2, should be targetted for elimination or urgent control. It is further recommended that invasive willow clones should be considered for listing as a threatening process and/or as a pest plant or noxious weed under legislation.

2. PRINCIPLES UNDERPINNING MANAGEMENT PLANS.

(a) Priorities for any removal programs should be

- i) midstream willows;
- ii) fragile willow species; and
- iii) species contributing to seed production as per Appendix 2.

(b) Best practice willow control methods be developed that are environmentally and economically acceptable, including hormone formulations and application techniques, timing, equipment, costs, potential impacts and disposal of the removed product. In addition, develop appropriate revegetation techniques and a list of alternative species for revegetation.

(c) Ensure appropriate approvals are sought and the full cultural and heritage significance of willows is assessed prior to removal of any willows to allow appropriate conservation.

(d) The Working Group further recommends that an assessment be made of willows in the ACT, including numbers, species, sexes, germination conditions, rates of spread, pests and diseases and potential for biological control; and priority areas for control as background data to management plans.

3. LIMITATIONS ON IMPORT, SALE AND CULTIVATION OF WILLOWS.

(a) An immediate ban should be placed on the sale and planting of those species listed in Appendix 2.

(b) Ensure the new AQIS policy on willow importation is made known to the community and relevant industry bodies.

4. ASPECTS TO BE ADDRESSED IN A COMMUNITY AWARENESS AND EDUCATION PROGRAM.

(a) Identification of species that should be eliminated from sale. This could include prominent warning labels being attached to all willows permitted to be sold indicating the potential hazards of willows with a recommendation that they should not be planted within 1 kilometre of streams, creeks, rivers and dams.

(b) Information and training be made available on best practice willow control methods - see 2 (b).

(c) Foster an understanding of the negative and positive impacts of willows and their cultural and heritage significance.

5. ISSUES WHERE THE ACT COULD MAKE FURTHER SUBMISSIONS TO FEDERAL, STATE AND REGIONAL GOVERNMENT FORUMS.

(a) Negotiate and liaise with Federal and State Governments (especially NSW) to develop unified importation bans on willows.

(b) Promote cooperative research on willow ecology and biology including existing species, their occurrence, rate of spread, flowering times, sexual compatibility, seed viability, germination conditions, germination rates, impacts on riparian systems and markets for willow materials.

4. OVERVIEW OF WILLOWS IN THE LANDSCAPE

Willows have played an important role in land management in Australia. This role has become more controversial in recent years as community awareness of biodiversity and land and water management issues has increased, and because the impact of willows have become more obvious.

4.1 The nature of positive impacts of willows:

The willows' ability to grow rapidly (especially in cool areas), propagate easily, the scarcity of diseases and pests and their fibrous root systems have made willows a valued and sought after species for stabilising river banks where the original native vegetation had been removed or has succumbed to grazing pressures. The loss of stream bank vegetation in the past through grazing and deliberate clearing provided the opportunity required for willow domination along streams where today they sometimes play an important role in minimising erosion. For example, the outside of a stream bend is where the greatest possibility of erosion can occur, and willows growing in these positions assist in bank stability.

Willows have been used in landscape plantings, and for shade and windbreaks. They are a familiar part of the rural landscape character and fabric of urban areas as well as providing recreational amenity. For example, at the Molonglo River Water-ski Area willows protect banks from turbulence created by watercraft.

Willows have been considered an effective plant to use as a vegetation barrier against streambank and channel erosion. Their fibrous root mass is able to hold streambanks, especially in areas adversely affected by river regulation.

A range of bird life, some invertebrates and platypus have been observed associated with willows (although native fauna's preference for willows over native vegetation has not been substantiated).

Willows have the potential to provide a limited source of fodder for sheep and cattle (especially during drought) and possibly through pollen for bees in the spring.

4.2 Cultural and Heritage Values:

Certain willow species were among the earliest exotic trees introduced into the region and form part of European cultural heritage. Willows have been seen by many people as a "natural" component of the landscape by virtue of the fact that they have become naturalised along waterways and were widely used in landscaping.

There is a need for the development of a register for heritage willows. At an early stage of any willow management proposal, a professional assessment should be made of the heritage significance of the willows present. Weeping Willow (*Salix babylonica*) are generally recognised as culturally significant and should be identified and listed with appropriate protection and management measures where applicable.

4.3 The Nature of Adverse Impacts of Willows:

The same characteristics that have made willows so popular have also contributed to their invasive potential. They are so successful that they have invaded and dominate some riparian areas to the exclusion of native riverine species and have major implication for the biodiversity and hydrology in these riparian areas.

It should also be noted that willows have so far reached less than 10% of all the environmental niches that are suited to their establishment in Australia (Cremer 1997).

4.4 Reproductive capacity:

Willows have the potential to reproduce vegetatively through detached branches which are able to form roots. This ensures that over time clones of the source plant can eventually occupy all potential downstream willow sites.

With some willows now producing abundant viable seed the rapid infilling of suitable habitats along stream edges is accelerating. The introduction of new fertile species and varieties of willows have exacerbated this invasive capacity. Until recently it was believed that only one gender of each willow variety and species had been introduced to Australia, so that the production of viable seed would not occur. This control technique obviously did not take into account the possibility of cross fertilisation.

In 1994 willow seedling populations were observed in the bed of the Numeralla River. The largest seedling population probably germinated in 1993 (in excess of 100,000 plants) and the oldest population (1,000 plants) probably germinated around 1980 (Cremer 1995b). Further investigation has shown that stretches of the Murrumbidgee and other rivers and creeks in NSW, Victoria and Tasmania are also heavily infested with willow seedlings.

The most immediate concern is the proliferation of willow seedlings that, if left to grow, will obstruct river channels and become a direct cause of bank erosion and decline in water quality (see Fig. 1). As both male and female trees will arise from seedlings, their capacity to produce viable seed will escalate river degradation problems and contribute in an exponential way to the numbers of seedlings produced in future years.

4.5 Erosion and Flooding:

Willows growing in the channel of a stream can force flows against banks and cause erosion. They can anchor sediment that would otherwise be moving through the streams (this can lead to a decrease in channel capacity and localised flooding). They trap debris that is carried during higher flows and force the water to back up leading to localised flooding, severe bank erosion and damaging bridges and other structures.

Willows growing on the inside of the stream bend can cause higher flows to be deflected against the outside bank leading to erosion.

They also contribute to siltation of water storages and changed flooding patterns through modifications to stream morphology and flow characteristics.

Willows are considered by some to reduce the amount of water in creeks and rivers through transpiration (though this has not been substantiated).

4.6 Impacts on Biodiversity:

Willows frequently dominate riverine environments causing severe modification to the in-stream environment and large-scale disruption to food webs, nutrient cycling and loss of associated indigenous fauna.

The effect of shading from the dense canopies of willows effectively eliminates the establishment of other plant species, resulting in reduction of habitat and biodiversity.

Willows can seriously degrade ecological functioning and habitats, upon which other native organisms depend. Aquatic plant life and micro-organisms and native fish are particularly affected.

The deciduous nature of willows has a high impact on water quality at leaf fall through reduction in levels of available oxygen.

5. KEY AREAS FOR MANAGEMENT

The following areas are identified as essential to the management of willows in the Upper Murrumbidgee Catchment:

5.1 Priority Species and Locations for Willow Control:

Willows of any species that grow in midstream where they block or divert water flow should have priority for control, followed by willows of any species growing within creeks or on river banks in such locations that high or medium water flows are diverted into banks.

Fragile willows growing in waterways or on banks, which contribute broken branches, which are capable of establishing a new plant also need to be managed.

Species contributing to seed production. Seedlings pose the greatest threat as these consist of a whole new array of male and female clones that are capable of producing viable seed in quantity by around age 10. All species, which can reproduce sexually including female clones producing viable seed, should be targeted for control. Willows that are considered invasive and recommended for either strict control and/or elimination are listed in [Appendix 2](#).

Immediately prohibit the sale and planting of clones of *S. matsudana x alba* (commonly referred to as "New Zealand hybrids"), particularly female varieties, 'Cannock', 'Te Awa', 'Tangoio' and 'Makara' as they are very brittle, produce seedlings and have the ability to fertilise other genera of willows.

5.2 Importation:

The genus *Salix* is exotic. There are no species of *Salix* that are native to Australia. At this stage there are approximately a dozen known species of willow contributing to seedling spread in Australia, and it is becoming more obvious that many more species may be involved. [Appendix](#)

2 provides a list of the known problematic species at the time of preparation of this strategy. Most of these species have been present for a minimum of some decades. They are cross breeding and producing hybrid offspring of which the hybrid vigour factors are unknown. Hybrid offspring are also making identification difficult. Some hybrids are already known to be more invasive than the parent species. However, there are over 300 willow species world-wide and, based on the knowledge we now have of the problems created by willows, there is an urgent requirement to discontinue any further willow importations until safe species and varieties have been identified and/or developed.

A request by the Australian Weeds Committee in 1995 resulted in the Australian Quarantine Inspection Service (AQIS) placing a one year moratorium on the importation of willows but did not prevent the release of 47 new species and varieties of willows that had already been imported into Australia. These plants were subsequently released from quarantine into a private plant arboretum in Victoria. The potential of these plants to contribute to willow weed problems is large if they are released to the general public.

The Assistant Director of the Plant Quarantine Policy Branch of AQIS has since provided advice that:

"...AQIS will not approve importation of any Salix planting material unless, based on information provided by the AWC (Australian Weeds Committee), it is satisfied that it does not pose a weed quarantine risk" (AQIS 1997).

This is, at last, recognition of the problem by AQIS. It is recommended that the AQIS policy on the importation of *Salix* spp. and varieties be made publicly known, and that lobbying campaigns be initiated with Federal, State and Local governments and the horticultural industry with the view to rationalising those species already available within Australia.

It is recommended to identify offending clones as either a threatening process or declaration as a noxious weed and banning importation into the ACT of these clones. The ACT government should liaise with the Federal and State (esp. NSW) Governments to have complementary bans to reinforce the actions taken by the ACT. Co-operation between these governments is also essential as many of the benefits of willow control within the ACT will occur further downstream in NSW, Victoria and South Australia.

5.3 Sales and Availability:

All willows have been identified as problematic due to their brittle nature and/or known ability to produce viable seed that establishes highly aggressive seedlings. Species of particular note that should be eliminated or targetted for urgent control are listed in Appendix 2. It is recommended that these species be removed from sale immediately, and that consumers do not purchase or propagate from feral clones of these species.

Other species that are identified as highly problematic in the future should also be removed from sale. **It should be noted that professional advice received by the Willows Working Group has called for a complete ban on the sale of all willows until safe clones have been identified (Cremer per.comm. 1997). This advice may well prove to be correct until the problem is rationalised.**

Where willow plants are available for sale it is recommended that prominent warning labels should be securely attached to individual plants stating:

- the potential hazards involved with planting willows
- that willows should not be planted within one kilometre of a watercourse, wetland, dam or lake.

Planting of sterile clones and weeping willows and other non-invasive species should be permitted provided they are not within one kilometre of a watercourse, wetland, dam or lake.

Staff of nursery and agricultural retail outlets and any organisations dealing with "greening", agricultural and biodiversity issues should be trained in willow identification and management, and especially in alternative species useful for river management, thus reinforcing the integral role they play in raising the awareness of consumers.

5.4 Education, Awareness and Extension:

The preparation and development of education strategies or campaigns targeting community, government and industry sectors are vital in combating a problem, which is large and diverse. This is an important and continuing part of any management strategy, particularly in view of the widely held belief that willows, although "naturalised" within the landscape, are native Australian species.

Within the community there is a diversity of views on both management of willows and their cultural and heritage significance. Community participation in the development of any education strategy will foster ownership and avoid further social tensions. An understanding between the negative and positive impacts of willows and their cultural and heritage value would need to be demonstrated in a balanced and constructive manner.

It is recommended that:

- there be continued promotion of willow issues through the general media;
- general and technical information on willows and willow identification, control and management be made available to the general public and stakeholder groups and organisations. Utilise and distribute publications, both general and technical, that are already available, e.g. utilising the internet and government shopfronts for the dissemination of material;
- an education kit be developed supported by funding to target local councils, landcare groups, landowners, the general public, the media and in particular, school children and industry;
- best practice techniques be promoted including species that can be used as practical and ornamental landscaping within the urban area and highlighting the impact willows have in relation to erosion and streambank stability;
- specific campaigns should be developed for the nursery industry, focussing on identification of specific clones that should be eliminated from sale
- willow management measures be promoted through workshops, field days, rural shows;
- alternative species to willows be promoted, particularly local Australian native species;
- warning labels be securely attached to propagated plants sold by nurseries;

- Information be made available on appropriate removal methods to ensure land managers are up-to-date with techniques for control and removal including appropriate chemical usage. Involve community and industry in developing revegetation programs using alternative native species after selective removal; and
- All three levels of government need to be informed as to the magnitude and urgency of the problem since willows know no boundaries.

5.5 Legal Barriers:

Barriers imposed by current environmental laws restrict the widespread management of willows, particularly near waterways. Some legal impediments are:

- Currently, it is illegal to remove or damage vegetation, without a permit, from within 20 metres of the banks of nominated waterways in NSW. However, these laws vary from state to state. In NSW, in order to manage willows near waterways, it is necessary to obtain a tree removal permit from the Department of Land and Water Conservation. The exemption of willow tree removal from the Department of Land and Water Conservation's Riparian Vegetation Removal Policy would simplify the management of willows along waterways. This exemption, however, is heavily dependent upon the development of appropriate removal methods.
- Specific permission for "off-label" use of certain uses of weedicides on willows is needed. It should be noted that the recently introduced "Glyphosate Biactive" is to have a label change that will enable the use of this weedicide on all willows, using a defined range of application methods.
- Under pollution laws, such as the Clean Waters Act of NSW (1970), there are restrictions on the use of weedicides near and within waterways. This regulation can also prevent the management of willows.

5.6 Research:

There is a need for continued research on willow issues. These include:

- Ecological supersedure needs to be examined where willows are interplanted by other plants which might eventually overtop willows and block their sunlight and might, over time, replace the willow. Further research on this technique is needed.
- Best practice willow control methods be developed that are environmentally and economically acceptable, including hormone formulations and application techniques, timing, equipment, costs, potential impacts and disposal of waste.
- An assessment be made of the problem in the ACT, including numbers, species, sexes, germination conditions, rates of spread, pests and diseases and potential for biological control; and priority areas for control. Identify and prioritise areas for willow management in the ACT and target areas for control.
- Willow ecology and biology be the subject of detailed research – existing species, their occurrence, rate of spread, flowering times, compatibility, seed viability, germination conditions and germination rates.

- Monitoring of willow impacts on riparian systems continues e.g. water flow, water quality, sedimentation, terrestrial and aquatic flora and fauna.
- Work be established to identify, develop and promote sterile, safe clones.
- Develop appropriate revegetation techniques and a list of alternative species for revegetation be prepared and made available.
- Establish both terrestrial and aquatic monitoring programs to ensure ecosystem restoration is achieving desired objectives. From ecological and biological data investigate the potential for developing predictive model for seed and seedling production.
- Examine the implications of and potential uses of willow, and markets for willow materials including use as mulch, firewood, for woodcraft, and for use by competitive woodchoppers.

6. OVERVIEW OF ON-GROUND MANAGEMENT

The following points outline the likely direct and indirect effects from killing and/or removing willows. Management and control programs must take account of such effects to avoid damage arising from the control program.

Staged removal should be undertaken over a number of years commencing in the upper reaches of each catchment and working downstream. Revegetation programs should be concurrent with removal programs and will contribute to public acceptance of the removal of trees. The use of best practice techniques and promotion of follow-up revegetation will help avoid secondary weed infestations. The whole river catchment must be targeted with co-ordinated action from both New South Wales and the Australian Capital Territory.

Removal of willows over a large length of stream should be avoided as mass removal can lead to streambed degradation, locally raised water temperature, provision of sites for erosion and colonisation by new species both native and exotic and threaten infrastructure associated with streams (e.g. bridges). The best control method of removal of willows over a large area is to remove 20% of willows in the first year, 20% of willows in the second year, and so on. In critical situations removal of vegetation to prevent impedance to water flow that could cause flooding that threatens residences, stormwater structures and earth embankments could be undertaken as a priority.

Particular care should be taken in controlling willows, which have been planted for the purposes of soil or bank stabilisation. Where possible alternative vegetation should be established prior to willow removal. If willows are seeding, heavy pruning may retain root function while limiting seed set.

Elimination of young seedlings is a cost-effective way of keeping waterways free of potential blockages, erosion and streambed change. The hand pulling of seedlings is the most practical and environmental safe method for removal of young plants. For larger plants application of herbicide in the growing season should be effective.

Prescribe a minimum planting distance for willows of at one kilometre from all waterways.

Apply the precautionary principle, assessment of potential ecological, environmental and social impacts through EIS.

Dead trees can lose their grip on soil, start to rot and have a greater risk of being washed downstream after they have been killed. To avoid a greater risk of blockages and damage downstream dead trees should be removed as soon as practicable.

If live trees have been knocked over and crushed, the resulting soil disturbance combined with numerous woody fragments, can create a new denser willow thicket as the plants propagate vegetatively.

A theory of ecological supersedure, where willows are interplanted by other plants which might eventually overtop willows and block their sunlight has been proposed. However this idea, which might, over time, replace the willow and avoid detrimental effects of willow destruction has not been substantiated.

Current removal methods are estimated at between \$200 and \$500 per tree. Consideration of uses for the removed vegetation may be able to offset this cost.

6.1 Assessment:

The following information provides a practical overview for undertaking a willow management project:

- Ensure full cultural and heritage significance of willows is realised prior to removal of any willows to ensure appropriate conservation.
- If willows are absent do not introduce any willow plants, male or female. Willows should be prevented from establishing in these areas.
- Where the site is generally unsuited to the spread of willows do not introduce aggressive willow species e.g. *S. nigra* and *S. cinerea*.
- Where the presence of willows is undesirable (e.g. areas designated for conservation or with high conservation value), they should be eliminated.
- Where only one species of willow is desired (e.g. Weeping Willow for cultural heritage reasons) action should be taken to eliminate all others and prevent any other species establishing. Propagate only from safe clones.
- Where unwanted willows appear to be spreading only by detached branches, e.g. where only male Crack Willow (*S. fragilis*) is present, eliminate all individuals in the watercourse and as many of the parent trees as is appropriate. Do not introduce any female trees.
- Where willows are spreading by seed, conduct surveys to locate female trees for removal.

6.2 Intensive Survey:

All willows that have been identified for removal should be recorded on a map and given a priority ranking for removal. Priorities should reflect the capacity for seed set and the physical impact on the watercourse, as well as impact on biodiversity, e.g.:

High priority

growing in bed of watercourse.
blocking or diverting water flow.
confirmed setting viable seed.
seeding within 2km of rivers.

Medium priority

growing on banks of watercourse.
affecting low and medium flows.
likely to be producing viable seed.

Low priority

growing away from watercourse. not producing seed or contributing to seed set.

6.3 Approvals:

Approvals must always be sought before any tree removal project on riparian zones are commenced. It is important to:

- advise land managers of problem willow species and seek agreement before destroying trees. It is important to offer replacement plants or advise on suitable alternative species; and
- seek approval and advice from any relevant authorities prior to destroying and/or removing trees.

6.4 Control:

Deciding on the form of control varies from site to site. Various techniques are available. Removal should commence in the headwaters of a catchment and proceed downstream working in sections. Where possible removal should be undertaken along a section of watercourse between control points (rock beds, culverts, gabions etc) to minimise risk of bed or bank erosion. Working upstream within each section may minimise the risk of scouring. Careful monitoring of stream bed and banks for any acceleration of erosion is essential; any erosion arising as a consequence of willow removal must be controlled before further willow removal is undertaken.

Removal should be a staged process undertaken over a number of years with revegetation of cleared areas undertaken as soon as possible after willow removal to stabilise soil and minimise secondary weed invasion. Revegetation should be with local riparian species, including rushes and sedges.

Removal should be undertaken having regard to the above priorities and include:

- thinning sections rather than attempting total removal in one operation;
- removing willows on straight sections of watercourse first, and from the inside of bends;
- remove willows from outside bends last after ensuring bank stability;
- avoid breaking root mats of willows growing on banks; and
- all broken live branches must be prevented from washing downstream, collected and removed/destroyed.

Mechanical Removal.

- Seedlings less than 0.5m tall can be pulled out by hand at any time of the year.
- Trees growing in watercourses may need to be removed totally using heavy machinery e.g. backhoe with log grab. Great care must be taken to avoid embedding live broken branches in sediment where they are likely to grow. Usually such trees are killed before removal.
- Where willows that grow on the inside of the stream or in the streambed are removed the meander bar that contains the roots should be ripped to loosen the sediment to allow it to be transported during the next high flow.

Chemical Control

- Trees marked for removal should be poisoned during January to March. Foliar spray should be used only as a last resort. Preferred methods include stem injection, frilling, and treatment of cut stumps.

6.5 Follow Up:

When treated trees have died the above ground portion of the tree must be removed to ground level. This is to assist in preventing debris problems during flood events. The roots of the willow must be retained, as they will ameliorate erosive effects until the area is revegetated.

Revegetation (preferably with native species) should commence as soon as practicable after the tree has died or has been removed.

Continue intense monitoring for three (3) years after removal programs and occasionally over subsequent years against the spreading of new willows should be ongoing.

7. SUGGESTED READING & REFERENCES

- Cremer, K.W. 1995a.
"Survey of Willow Seedlings and the Source of Their Seed in the Numeralla River". Unpublished.
- Cremer, KW. 1995b.
"Willow Identification for River Management in Australia". Technical Paper No. 3. CSIRO Division of Forestry.
- Department of Land and Water Conservation. 1995.
"The Willow - Friend or Foe".
- Greening Australia 1994.
"Willow Watch". Greenotes No 16.
- Parker, G. and Bower, D.
Willow Management Guidelines. Landcare Tasmania.
- Trounce, B. and Cremer, K.W.
"Willow Control". NSW Agriculture 1997.

APPENDIX 1

TERMS OF REFERENCE

The purpose of the review is to propose an appropriate policy for the management of willows in the ACT, based on an assessment of the role of willows in the ACT landscape, the appropriateness of particular species and eradication measures, and the best ways of educating the public on the issue.

THE REVIEW SHOULD ADDRESS:

- the nature of both positive and adverse impacts caused by willows in the ACT;
- those species of willows which should be targeted by a management policy;
- the likely direct and indirect effects arising from any killing and/or removal of willows;
- the availability of suitable control measures and the environmental and cost implications of these measures;
- implications for the import, propagation and cultivation, sale and transport of willows;
- approaches which will meet community needs for awareness, education and training about willow management issues;
- deficiencies in the knowledge base which require research.

RECOMMENDATIONS TO THE MINISTER SHOULD ADDRESS:

- those species which should be the subject of a management policy;
- principles underpinning management plans;
- limitations on import, sale and cultivation of willows;
- aspects to be addressed in a community awareness and education program;
- issues where the ACT could make further submissions to Federal, State and regional government forums.

REPORTING:

The Committee's report is to be provided to the Minister by October 1997.

APPENDIX 2

LIST OF SPECIES

List of willow species known to be contributing to seed production (at the time of preparation of this strategy) that need to be eliminated.

Salix nigra
S. alba var *vitellina*
S. matsudana x *S. alba* and clones
S. matsudana ‘Tortuosa’
S. rubens
S. cinerea
S. purpurea
S. glaucophylloides
S. viminalis
S. fragilis

Immediately prohibit the sale and planting of new clones of *S. matsudana* x *alba* (commonly referred to as "New Zealand hybrids"), particularly female varieties, ‘Cannock’, ‘Te Awa’, ‘Tangoio’ and ‘Makara’ as they are very brittle, produce seedlings and have the ability to fertilise other genera of willows.

List of willow species that need to be targeted for urgent control and/or management:

S. alba var *vitellina* x *S. fragilis*
S. babylonica
S. caprea
S. matsudana ‘Pendula’