National Willows Program

This is your opportunity to have input into the way willows are managed in Australia

The National Willows Program has just commenced a national weed risk assessment of all the willows in Australia. This assessment aims to:

- ♦ determine which willows pose the biggest weed risk and, as such, should be the focus of control programs and
- ♦ find out which willows the nursery industry is interested in growing that are likely to have a low weed risk and thus be considered ‘safe’ willows.

As you may be aware, noxious weeds’ legislation bans the sale of all willows (the whole *Salix* genus) in Australia, with a few exceptions that differ from state to state. There are over 300 species of willows in the world, and more than 100 kinds have been introduced to Australia at some stage, so we cannot assess them all individually. We have therefore developed a list of willow species, hybrids, varieties and groups that we consider a priority for weed risk assessment.

We welcome you to view the attached list and selection process, and let us know if there are any other willows you would like to add and why you consider them important (e.g. they have high ornamental value, appear to have a low/high weed risk etc). In addition, if you have any information or expertise on any willows that could assist us in this process, we would greatly appreciate it, as we currently have to rely on overseas data for the assessment of many species.

Please send any comments by Friday 1st September to the WoNS National Willows Coordinator, Sarah Holland-Clift: Sarah.Holland-Clift@dpi.vic.gov.au or Fax (03) 5226 4725 or by post PO Box 103, Geelong VIC 3220.

For further information, please contact the National Willows Coordinator.

Given that there are over 300 willow taxa world wide, with a complex variety of species, subspecies, varieties, hybrids and cultivars, it is not feasible to assess the weed risk of all willow taxa individually. We have therefore adopted an objective process to determine which species or groupings of willows will be assessed, as outlined below. Table 1 provides the list of willows proposed for assessment. Table 2 lists all other willows that have been introduced into Australia, but will only be assessed as part of the subgenera groupings, unless otherwise proposed.

Process for the selection of willows to be assessed

Assessments will be made of the following willows (*Salix*) that are present in Australia; either naturalised or in cultivation:

1. Each of the three Salix subgenera: Salix, Vetrix & Chamaetia (according to the taxonomy of Skvortsov, 1999).

Species within a subgenus and the hybrids that form between them (within that subgenus) often share many biological and ecological traits. An assessment of each subgenus can use high quality data to give a broad picture of the invasiveness of whole groups of willows. This enables us to make predictions about the invasiveness of those willows that we have very little information about. It will also assist land managers to make decisions about willow management where there is uncertainty about the identification of the willows in the field. It is easier to identify the subgenus that a willow belongs to, than to work out exactly which species or hybrid the plant is.

2. All naturalised species and named hybrids

Willows have naturalised in Australia, both as recognised species and as hybrids between those species. To confidently assess these willows it is important that the data used can be attributed to a particular type of willow. Most willows will be assessed at the species level with notes about the subspecies, varieties etc. if they differ significantly from each other.

It is difficult enough to identify individual willow *species* and even harder with *hybrids*. Of the hybrids, our focus will be on those willows that have been named according to the *Code of Botanical Nomenclature* (see Lumley & Spencer (1991) for further explanation) as literature describing these "named" hybrids is more likely to be consistently referring to the same plant. Hybrids that have been named according to the *Code* can be identified in the literature, because they are written with a cross between the genus and the species, eg. *Salix* x *reichardtii*.

3. Willows not naturalised in Australia that have become naturalised far beyond their native range

One of the best indicators that a plant will naturalise in Australia is its ability to naturalise elsewhere in the world. This will include, in particular, those willows that have naturalised in New Zealand and Oceania, where there are no native species within the genus *Salix* (Skvortsov, 1999).

4. Willows not naturalised in Australia that exhibit invasive traits, such as forming dense thickets

If these willows were to naturalise in Australia, they may have the potential for major adverse impacts on environmental, agricultural and social values in Australia. A weed risk assessment can determine whether a particular willow poses a low or high weed risk.

5. Willows not naturalised in Australia and suspected of having a low weed risk

Willows have social and economic value as cultivated plants. It would be useful to know which ones might be suitable for cultivation from a risk management perspective. These might include single-sex sterile clones with flexible (not brittle) stems. We particularly require input from the nursery and garden industry on which plants we should assess in this category.

6. Willows exempt from noxious weed legislation

Salix babylonica, Salix X *calodendron,* and *Salix* X *reichardtii* (exempt everywhere in Australia); and *Salix caprea* 'Pendula', *Salix alba* x *matsudana, Salix matsudana* 'Aurea', *Salix matsudana* 'Tortuosa', *Salix myrsinifolia* and *Salix alba* var. *caerulea* (exempt in Victoria) (Faithfull, 2006). Although these willows are not covered by noxious weed legislation in every state, some have naturalised and some have the potential to naturalise, so it will be useful to know how they compare to other willows from a weed risk perspective.

The weed risk assessment process and list of willows to be assessed

The weed risk assessment process that will be used to assess these willows follows the principles contained in the Proposed National Technical Specification for Post-Border Weed Risk management produced by the CRC for Australian Weed Management. There is a full description of this process at www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/weeds_vic_nox_review.

The weed risk assessment team will use published data and expert opinion to answer a set of questions about each kind of willow. This covers its invasiveness/biology (methods of reproduction, hybridisation, dispersal, establishment, growth rate and competitive ability) and its impacts/ecology (its effect on native flora and fauna, waterways, agricultural productivity and recreation).

We also identify the willow's naturalised and native climatic range and the vegetation types it can grow in, so we can predict where it is likely to establish in Australia. We compare the amount of land that the plant is likely to establish in, with the amount of land that it currently occupies (if any) to give an indication of how much further it might be able to spread.

These three factors, invasiveness, impacts and potential distribution, are used to calculate a weed risk score for each type of willow. This allows us to rank each willow from highest to lowest risk and then to decide which willows

a) have a high risk and thus should be the focus of control programmes or, alternatively,

b) appear to pose a low risk and thus may be considered 'safe' willows for horticultural use.

Table 1: Proposed list of subgenera, species, varieties, hybrids and cultivars to be assessed

Willow	***Notes***	***Reason for assessment***
S. subg. Chamaetia		1. Subgenus
S. subg. Salix		1. Subgenus
S. subg. Vetrix		1. Subgenus
S. aegyptiaca	Syn. S. medemii (Cremer, 2003)	2. Naturalised (ARMCANZ)
S. alba	Incl. vars. alba, sericea & vitellina	2. Naturalised (ARMCANZ)
S. alba coerulea	Cricket bat willow	6. Exempt (ARMCANZ)
S. alba x matsudana	New Zealand hybrid	2. Naturalised
S. babylonica		2. Naturalised (APNI)
S. caprea		6. 'Pendulina' is exempt (Faithfull, 2006)
S. cinerea	Incl. ssp. oleofolia & cinerea	2. Naturalised (APNI)
S. daphnoides		3. Naturalised in NZ (Van Kraayenoord et al, 1995).
S. eleagnos		3. Naturalised in NZ (Van Kraayenoord et al, 1995).
S. eriocephala		3. Rhizomatous, introduced & naturalised in England (Stace et al,)
S. exigua		?. Excluded from import by AQIS (Carr et al, 1994), but appears in Ladson et al (1997) & NGIV list.
S. fragilis		2. Naturalised (APNI)
S. glaucophylloides	This name was misapplied to S. myrcoides (APNI)	2. Naturalised (ARMCANZ)
S. gracistyla		4. Can spread to form dense thickets (Van Kraayenoord et al, 1995).
S .humboldtiana 'Pyramidalis'	Syn. S. chilensis 'Pyramidalis'	2. Naturalised (APNI)
S. matsudana	Incl. S. matsudana 'Aurea' & S. matsudana 'Tortuosa'	2. Naturalised (ARMCANZ)

Willow	***Notes***	***Reason for assessment***
S. myrsinifolia	Syn. S. nigricans	6. Permitted list in Vic (Faithfull, 2006)
S. nigra		2. Naturalised (APNI)
S. pentandra		Naturalised in the US (Argus, 1986);
S. purpurea		2. Naturalised (APNI)
S. triandra		2. Naturalised (APNI)
S. viminalis		2. Naturalised (APNI)
S. x calodendron		2. Naturalised (APNI)
S. x mollissima		2. Naturalised (ARMCANZ)
S. x pendulina		2. Naturalised (APNI)
S. x reichardtii		2. Naturalised (APNI)
S. x rubens		2. Naturalised (APNI)
S. x sepulcralis	Incl. vars. sepulcralis & chrysocoma	2. Naturalised (APNI)
S. x sericans		2. Naturalised (APNI)

Other willows present/introduced to Australia

The list below may contain willows that have a low weed risk. Many of these plants have had very little written about them. In your opinion, which of the following are willows that would be useful in gardens, landscapes and nurseries, and do you have any information (either published literature or your own observations) about that would assist us in conducting a weed risk assessment of them? We are also interested to know if there are willows in Australia or that you wish to import to Australia that are not on this list, but that seem to have a low weed risk.

At present, the species on the list below will not be assessed individually, but will be considered within the subgenus group assessments, as no distinguishing features have been identified that would give reason to separate them from their group. If you think that any of these species should be individually assessed, we would like to know which ones and why, so that we can ensure the assessments are as comprehensive as possible and adequately address industry needs and concerns. Please bear in mind, however, that it is not feasible for all species to be assessed individually.

Table 2: Willows introduced to Australia that will only be assessed as part of the subgenera groupings, unless otherwise proposed.

Willow	***Notes on potential weed risk***
S. acutifolia 'Blue Streak'	Hybrids with S. caprea (m) & S. cinerea (m) are known (Meikle, 1975).
S. alpina	
S. apoda	
S. arbuscula	
S. arctica	stems flexible (Skvortsov, 1999); S. arctica form colonies by layering, but only grow to 3-25 cm (Argus, 2003)
S. bockii	
S. 'Boydii'	
S. cantabrica	
S. caroliniana	True tree, predominantly riparian (Argus, 1986)
S. caspica	
S. cavaleriei	

S. coerulea	?
S. cordata	Syn S. eriocephala (Argus, 1986)
S. elbursensis	
S. fargesii	
S. gatungensis	
S. giliana	From arboretum- ?S. gilgiana? (Newsholme, 1992; Argus, 1986)
S. glauca	S. glauca 0.3-5m tall forming thickets on subalpine slopes, creeks and rivers (Welsh, 1974)
S. hastata 'Wehrhahnii'	
S. helvetica	
S. hibernica	
S. hookeriana	branches highly brittle at bases (Argus, 2004)
S. humilis	Clonal by layering, may form patches several metres across, predominantly non-riparian (Argus, 1986)
S. integra 'Hakuro-nishiki'	
S. irrorata	
S. japonica	
S. jessoensis	
S. koreensis	trees to 20m tall (Chao & Gong, 1999)
S. koriyanagi	
S. lanata	
S. lapponicum	?
S. lapponum	Hybrids with S. purpurea (m), S. nigricans (m) [syn. S. myrsinifolia] & S. caprea (f?) are known (Meikle, 1975)
S. lasiandra	brittle to flexible stems (Argus 2003); not colonial. Tall shrubs to trees (Argus, 2003)
S. lasiolepis	
S. longipes	
S. lucida	Trees of riverbanks, frewshwater swamps and moist allubial bottomlands…often seen standing in shallow water in still river backwaters (Brayshaw, 1996). Predominantly riparian, True tree (Argus, 1986); Incl. ssp.

	Lasiandra
S. magnifica	
S. melanostachys	
S. moupinensis	
S. myricoides	
S. myrtilloides ‘Pink Tassels’	
S. neotricha	
S. phylicifolia	Hybrids with S. nigricans (f) [syn. S. myrsinifolia] are common in the British Isles; hybrids with S. caprea (f?), & S. cinerea (f); and triple hybrids with S. caprea & S. viminalis; S. cinerea & S. nigricans; and S. cinerea & S. viminalis are known (Meikle, 1975).
S. populifera	
S. pyrifolia	stems flexible (Argus, 2003); S. pyrifolia low to tall shrubs 0.4-4m not colonial (Argus, 2003)
S. repens	Hybrids with S. daphnoides, S. cinerea, S. nigricans [syn. S. myrsinifolia], S. caprea & S. viminalis; and triple hybrids with S. caprea & S. viminalis; and S. cinerea & S. viminalis are known (Meikle, 1975). Incl. ssp areneria, vars. Argentea, fusca & cvs ‘Iona’ & ‘Voorthizen
S. reticulata	stems flexible (Argus, 2003); (forms hybrids with S. lapponum = S. x boydii) & S. nigricans (f?) [syn. S. myrsinifolia] (Meikle, 1975); plants form colonies by layering, but only reach 0.3-15cm (Argus, 2003)
S. retusa	
S. rosmarinifolia	Non- alluvial (Skvortsov, 1999)
S. rotundifolia	S. rotundifolia forming rhizomatous colonies, but only growing 0.5-5cm tall, largely subterranean (Argus, 2004); stems flexible (Argus, 2004)
S. russelliana	S. fragilis x S. alba (Skvortsov, 1999)
S. sachalinensis	
S. sericea	Shrubs 0.5-4m tall, brittle branchlets, predominantly riparian, forms thickets in marshes, sedge meadows, acid bots, on rocky, silty or sandy strambanks & is a pioneer species on floodplains (Argus, 1986)
S. serissaefolia	
S. serpyllifolia	
S. sessiflora	

S. sessilifolia	Belongs to sect. Longifoliae, so it may form colonies by root shoots (Argus, 1986)
S. silesiaca	
S. subopposita	
S. 'Tortuosa Aureopendula' syn. 'Erythroflexuosa'	
S. woodii	
S. x blanda	
S. x dasyclados	No evidence to suggest that this willow occurs in Australia, except NGIV list
S. x finmarchica	
S. x grahamii 'Moorei'	
S. x laurina	
S. x multinervis	
S. x rubra	
S. x seringeana	No evidence to suggest that this willow occurs in Australia, except NGIV list & Crouch & Honeyman (1986)
S. x smithiana	
S. x stipularis	
S. yezoalpina	

References

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding* S, babylonica, S, *x* calodendron and S*. x* reichardtii*) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Australian Plant Name Index (APNI) Centre for Plant Biodiversity Research. Canberra, viewed: 24/07/2006, http://chabg.gov.au/cgi-bin/apni

Argus, G. W. 2003 *A guide to the indentification of* Salix *(willows) in Alberta*, http://aknhp.uaa.alaksa.edu/willow/index.htm

Argus, G. W. 2004 *A guide to the indentification of* Salix *(willows) in Alaska, the Yukon Territory and adjacent regions,* http://aknhp.uaa.alaksa.edu/willow/index.htm

Carr, G.W. Bedggood, S.E. Muir, A.M. & Peake, P. 1994 *Distribution and Management of Willows* (Salix) *in the Australian Alps National Parks*, Ecology Austalia, Melbourne.

Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.

Faithfull, I. 2006 'Declared noxious weeds-listed by category,' *Landcare Note LC0252c,* Department of Primary Industries, Frankston, Victoria.

www.dpi.vic.gov.au/dpi/nreninf.nsf/93a98744f6ec41bd4a256c8e00013aa9/007eb018efcfba9dca2571550017ae1c/$FILE/LC0252c.pdf

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Deparment of Natural Resources and Environment, Vic, Australia. Only have section 2.

Lumley, P. & Spencer, R. 1991, *Plant Names. A guide to botanical nomenclature,* Royal Botanic Gardens, South Yarra, Melbourne.

Meikle, R.D. 1975, *Salix* in Stace, C.A. (Ed.) *hybridization and the Flora of the British Isles*, Academic Press, London, new York, San Fransisco, pp.304-338.

Skvortsov A.K. 1999, *Willows or Russia and adjascent countries:taxonomical and geographical revision* (translated from Skvortsov, A.K. 1968, *Willows of the USSR. Tazonomic and geographic revision*, Nauka, Moscow), Joensuu University, Joensuu. www.salicicola.com/announcement/skv/skvortsov.pdf

Stace, C. van der Meijden, R. (ed.) & de Kort, I. (ed.) *Interactive flora of north western Europe*, ETI BioInformatics, Amsterdam, Netherlands, http://ip30.eti.uva.nl/bis/flora.php?selected=beschrijving&menuentry=zoeken&zoeknaam=salix#

Van Kraayenoord, C.W.S. Slui, B. & Knowles, F.B. 1995, *Introduced Forest Trees in New Zealand Recognition, Role and Seed Source.* No. 15. The Willows *Salix* spp., New Zealand Forest Research Institute.